DOCUMENT RESUME

ED 175 517 JC 790 511

AUTHOR Palola, Ernest G.; And Others
TITLE The Methodology of PERC (Program Effectiveness & Related Costs). Empire State College Research Series.
INSTITUTION State Univ. of New York, Saratoga Springs. Empire State Coll.
PUB DATE Apr 77
NOTE 166p.

EDRS PRICE MF01/PC07 Plus Postage.
DESCRIPTORS Budgeting; College Faculty; *Cost Effectiveness; *Data Analysis; *Data Collection; Educational Finance; *Evaluation Criteria; Institutional Research; Junior College Students; *Management Information Systems; Postsecondary Education; Statistical Analysis; Statistical Data; Systems Analysis

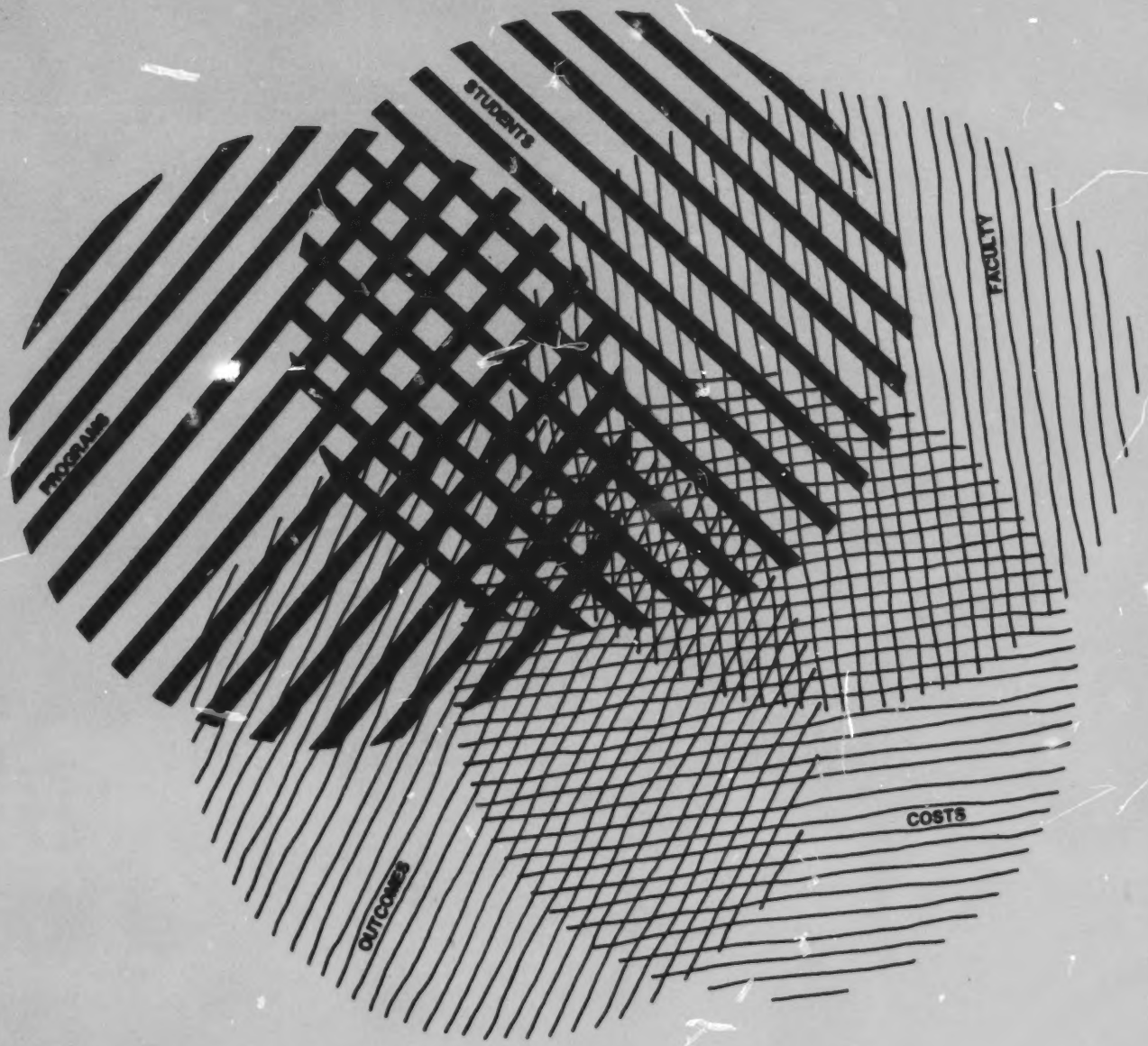
ABSTRACT

Program Effectiveness and Related Costs (PERC), a comprehensive data management plan developed at Empire State College, is the subject of this explanatory report. Chapter 1 presents the conceptual framework of the program which incorporates data on outcomes, costs, programs, students, and faculty, and also incorporates a "multiple perspectives strategy," that utilizes a variety of observers and methods in data collection. A key function of PERC is to provide information for decision making, and with this in mind, Chapter 2 examines the meaning and context of various policy questions in postsecondary institutions. Since PERC incorporates a variety of questionnaires, interview schedules, and rating forms, Chapter 3 is concerned with a discussion of instrument reliability and validity. Another major objective of PERC data analysis is the development and testing of typologies about students, faculty, and programs. Chapter 4 deals specifically with the dimensions of a student typology and a typology of learning resources as they were developed at Empire State College. Several appendices are included in the report, each dealing with more technical aspects of the general data management plan: specifically, editing, coding, and filing of data. Appendices also include a discussion of report-writing based on institutional research, and provide sample copies of various PERC data collection instruments. (Author/DR)

****
* Reproductions supplied by EDRS are the best that can be made *
* from the original document. *
****

ED175517

THE METHODOLOGY OF PERC
(Program Effectiveness and Related Costs)



JC 790 511

"PERMISSION TO REPRODUCE THIS MATERIAL HAS BEEN GRANTED BY
George Palola
TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)."

U S DEPARTMENT OF HEALTH, EDUCATION & WELFARE
NATIONAL INSTITUTE OF EDUCATION
THIS DOCUMENT HAS BEEN REPRODUCED EXACTLY AS RECEIVED FROM THE PERSON OR ORGANIZATION ORIGINATING IT. POINTS OF VIEW OR OPINIONS STATED DO NOT NECESSARILY REPRESENT OFFICIAL NATIONAL INSTITUTE OF EDUCATION POSITION OR POLICY

Empire State College Research Series

THE METHODOLOGY

OF PERC

(Program Effectiveness & Related Costs)

Ernest G. Palola
Morris Sunshine
Timothy Lehmann

Office of Research and Evaluation

Empire State College

Saratoga Springs, New York

April, 1971

PREFACE

This publication, The Methodology of PERC, provides technical support and detail for the PERC Handbook, published by Empire State College, January, 1977 (copies can be ordered by writing to the Office of Research & Evaluation). The Handbook is a research guide which enables decision-makers to gauge not only the cost of a program in relation to the costs of other programs, but also the cost of a program in relation to the educational effectiveness of that program.

The Handbook itself is a "how-to-do-it" set of definitions, instruments, and procedures which have been tested both for effectiveness and adaptability. Researchers from a variety of institutions - large, small, private, public, campus-based, extended - can adapt and implement the PERC model.

Due to PERC's emphasis on analysis and the use of multiple types of data, careful attention must be given to the technical problems, procedures and resources that this kind of analysis involves. We identified the problem as building a data management plan (See Glossary). The Exxon Education Foundation expressed interest in our need and provided a significant grant to work on the problem. Thus, in addition to providing PERC Handbook users with a technical manual on how to manage PERC data, this is the final report to Exxon for the project entitled, The Methodology of PERC.

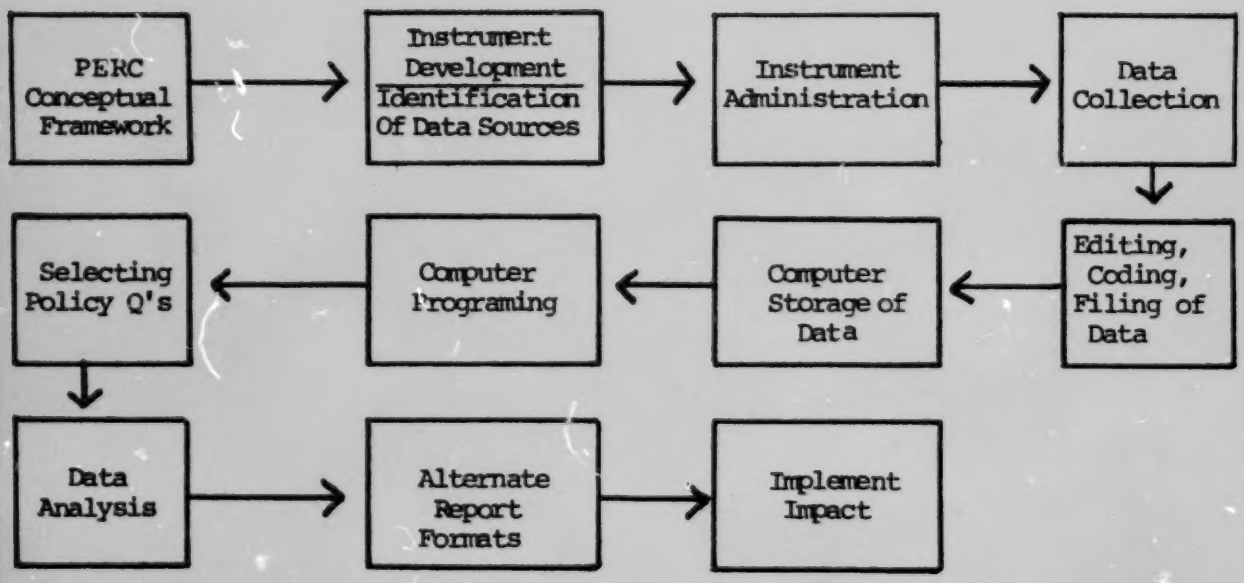
The main thrust of this report is collecting, sorting, storing, analyzing and reporting of PERC data, i.e., the introduction, explanation and illustration of the concept, data management plan. Understanding the use and importance of this concept is critical

to the successful application of PERC. A large amount and diverse array of data is collected in PERC, and PERC users need efficient and well-conceived plans about how these data will be analyzed and applied. Oftentimes institutional pressures for "answers" are strong which requires researchers to know what is or is not possible given the type and quality of data relevant to a question. To achieve desired results often necessitates careful thinking and a fair amount of planning and practicing (i.e., exploring different analysis strategies). The concept of and techniques behind a data management plan are the central concerns of this publication.

Overall, the elements of a comprehensive data management plan may be visualized as follows:

Figure 1

Elements of a Data Management Plan



These elements and their linkages attempt to communicate a chain of events and concerns in effectively managing large and diverse data piles. Briefly, we want to discuss each of the "boxes".

Productive research usually begins with a conceptual framework, that is, a statement, sometimes carefully developed and other times only roughly conceived, of the kinds of basic questions being researched. For PERC, we ask in a general way, what are the tangible outcomes (See Glossary) for students who have been exposed to specific programs cost? The outcomes/costs linkage is affected by the kinds of students and the kinds of faculty who participate. Thus, we know, at the outset, that PERC's approach will require some kind of data about outcomes, costs, programs, students and faculty (this framework is detailed further in Chapter 1).

For PERC to affect institutional decision-making, it must be capable of focusing important data on the various policy matters facing executive administrators (students and faculty may also be a source of policy questions). Thus Chapter 2 examines the meaning and context of policy questions in postsecondary institutions. In addition, data must be organized and analyzed according to a policy analysis framework. PERC data are collected using different types of instruments and tapping different time periods. In addition, plans must be set if one intends to undertake causal analyses. We offer the concept, chains of evidence (See Glossary) which aids in building causal arguments. Chains of evidence also get the researcher into problems of integrating qualitative and quantitative data.

Next we come to instrument development and the identification of data sources. Instruments and data sources flow more or less directly from the types of data identified as important and relevant via the conceptual framework. In PERC, a variety of questionnaires, interview schedules, rating forms and content analysis techniques have been designed and tested to solicit information about outcomes, costs, programs and the like. Samples of these instruments and directions about their use are presented in the PERC Handbook. Instrument administration and data collection are also developed at length in the Handbook. No new information is presented in this publication on these topics.

A key topic - instrument reliability and validity (See Glossary) - is examined in Chapter 3. Problems and issues encountered with PERC instruments are discussed. Further, actual data on the subject is presented, analyzed and discussed.

A major objective of PERC data analysis is the development and testing of typologies about students, faculty and the like. Chapter 4 of this document deals specifically with the dimensions of an ESC student typology and a typology of learning resource use in ESC's program.

Several appendices are included in the report, each dealing with other, but more technical, aspects of the general data management plan. The processes of editing, coding and filing data are important to effective and efficient data management. Information about these processes, as well as illustrative application, is presented in this report (See Appendix A).

The versatility and efficiency of data management can rely heavily on local computing capabilities and relations between the

research staff and staff of the computing center. PERC can make heavy demands on computer center staff and priorities. It is important to know where research work fits within computing priorities when pressures build to process enrollments, student billing, academic records and the like. PERC utilizes SPSS as its statistical and programming package. This program meets all requirements, so far, for various types of simple as well as sophisticated statistical descriptors and tests. Appendix B presents our best advice on handling the technical problems between PERC and the computer.

Critical to PERC is the successful dissemination and utilization of its data in institutional planning and decision-making. We maintain that reports must be tailored to user needs and processes must be followed to accurately tap and serve these needs. Appendix C discusses these topics and presents helpful advice and examples.

And lastly, Appendix D provides sample copies of various PERC instruments used in this publication.

The concept - data management plan - embraces more or less all elements diagrammed earlier. This publication places special emphasis on: the PERC conceptual framework and multiple perspectives strategy (Chapter 1), policy questions, data analysis approaches and illustrative policy question analyses (Chapter 2), instrument reliability and validity (Chapter 3), and student and program typologies (Chapter 4).

ACKNOWLEDGEMENTS

Exxon Educational Foundation

Frederick deW. Bolman, Richard Johnson

Empire State College

Faculty, Students, Administrators

Research Advisory Committee

George Dawson, Larry Lipsett, Betsy Steltenpohl, Robert Hassenger, Sharon Villines, George Bragle, Miriam Tatzel, John Neumaier

Office of Research and Development

Shirley Bishop, Linda Bleser, Virginia Brown, Carol Conway, Judy Dingman, Linda Duerr, Marge Kraus, Paul Bradley

TABLE OF CONTENTS

Page No.

Preface i

Acknowledgements vi

Chapter 1. The PERC Model: Strategy and Methods..... 1

- A Framework for Integration: Program Effectiveness and Related Costs
- A Multiple Perspectives Strategy

Chapter 2. Data Management Plan 12

- Role and Importance of Policy Questions
- Relationships in the PERC Framework

  Level I: Outcomes - Costs
  Level II: Outcomes - Costs - Students
  Level III: Outcomes - Costs - Students - Faculty
  Level IV: Outcomes - Costs - Students - Faculty - Programs

- Tactics in PERC Analysis

  Step 1: Identifying the Function of Variables
  Step 2: Reducing Data
  Step 3: Multivariate Analysis

- Integrating Analyses in PERC
- Illustrative Analyses for Policy Questions & PERC

  Student Mix in a College
  Student Enrollment Status (Full-time/Half-time)
  Area of Study (Major, Concentration)

- Final Observation

Chapter 3. Instrument Reliability and Validity..... 40

- Overview: Problems in Measurement
- Instrumentation and Special Problems in Inter-Institutional Comparisons
- Instrument Reliability, Validity and Dimensionality: Concepts and Methods
- Reliability, Validity and Dimensionality of Selected SBI and SEQ Items
- Analysis of SBI Question 40: Leisure Time Values
- SBI Question 41: Student Self-Ratings
- Analysis of SBI Question 42: Goals in Attending Empire State College
- Analysis of SBI Questions 44 and 45: Self-Ratings for Intellectual Competence and for Personal Development
- Summary

TABLE OF CONTENTS
(cont'd.)

Page no.

Chapter 4. Student and Program Typologies 76

- Formulating a Typology of Incoming ESC Students
- Typology of Learning-Resource Use: ESC's Program
- Summary

Glossary 97

Appendices

A. Administration, Coding and Record Keeping of PERC Instruments 100
B. Computer Processing for PERC 107
C. Alternate Reporting Formats 112
D. Sample PERC Instruments 122

Bibliography 123

List of Figures

Figure 1: Elements of a Data Management Plan
Figure 2: The Five Elements of PERC
Figure 3: PERC's Multiple Perspectives Strategy
Figure 4: Summary of Outcome & Cost Findings for MCES by Enrollment Status (FT/HT)
Figure 5: Summary of Outcome & Cost Findings for MCES Graduates by Area of Study
Figure 6: Question #40, Student Biographical Inventory
Figure 7: Varimax Rotated Factor Matrix for SBI Question #40
Figure 8: Chi-Square Correlations Between Selected Items from SBI Question #40
Figure 9: Question #41, Student Biographical Inventory
Figure 10: Varimax Rotated Factor Matrix for SBI Question #41
Figure 11: Question #42, Student Biographical Inventory
Figure 12: Varimax Rotated Factor Matrix for SBI Question #42
Figure 13: Questions #44 & #45, Student Biographical Inventory
Figure 14: Varimax Rotated Factor Matrix for SBI Questions #44 and #45
Figure 15: Student Typology: Factor Analysis of 63 Variables, Fall, 1974, N = 703
Figure 16: Student Typology: Factor Analysis of 63 Variables, Fall, 1975, N = 890
Figure 17: Student Typology: Factor Analysis of 63 SBI Variables, Fall, 1975, N = 1132
Figure 18: SBI Factor Similarities, by Cohort and Factor Number
Figure 19: Learning Resources Used by ESC Students in their Last Contract
Figure 20: Mentor Questionnaire: Learning Resources Used (N = 116)
Figure 21: Kendall Tau Correlations Between Eight Learning Resources
Figure 22: Factor Matrix Using Principal Factor with Iterations

CHAPTER 1

THE PERC MODEL: STRATEGY AND METHODS

In postsecondary education, many studies of student learning and college impact as well as studies of college costs have been made (see extensive list of references at the end of this publication). Today a new language and a new set of tools have been developed which seem to continue the basic pattern of student learning and cost studies of the past. Such studies are now called cost-benefit analysis, cost-effectiveness evaluation, program performance budgeting, unit cost studies, competency based education, computer assisted instruction, performance contracting, individualized instruction and so on.

With all the benefits of these computerized, system-like cost and instructional approaches, however, higher education still remains caught in a trap: the focus is on costs first and foremost and rarely are cost studies integrated with effectiveness studies. This chapter seeks to do three things: (1) provide a framework whereby assessments of educational effectiveness and associated costs are integrated, (2) discuss specific evaluation techniques and procedures, and (3) provide specific illustrations of PERC applied to policy issues at Empire State. The PERC framework provides new data for more informed decision-making.

Although there have been many studies of student learning and program costs in the past, there are serious conceptual design and use problems still unresolved. Let us first address some defects in previous studies of student learning and program effectiveness.

Student learning and growth is a complex process, not yet well

understood. Many ways to identify, conceptualize and measure educational outcomes (See Glossary) have been developed for use by traditional colleges and universities (Astin, 1974; Bloom et al., 1956, 1964; Bowen, 1974; Cox and Wildemann, 1970; Dubin and Taveggia, 1968; Lawrence et al., 1970; Lenning, 1974, 1975, and Micek and Wallhaus, 1973). To us, many of these conceptual efforts do not explore significant learning outcomes (for example, a common approach has been to reduce academic learning to grade point averages), examine student learning in highly standardized ways (for example, pre-post use of commercial tests to analyze student recall of selected subject matter knowledge) and focus on unidimensional components of learning (for example, academic knowledge to the essential exclusion of the students' intellectual and creative development, personality development, aesthetic and cultural development and moral, philosophical and religious development).

Such strategies of conceptualizing and evaluating student learning cannot deal adequately with individualized educational programs like Empire State College which emphasize student goals and objectives. Furthermore, such strategies do not fully asses "value added" (See Glossary) by an institution or program (Hartnett, 1974; Astin, 1974). Another difficulty with outcome research is that few studies of student learning successfully link change or development to the program or college environment. Two exceptions are the Bennington College studies (Newcomb, 1943, 1967) and more recent work at Harvard (Perry, 1968). Both use case study analysis to build a linkage between the program and resultant student change.

As serious as are the conceptual and design problems with most effectiveness research, the ways in which cost studies often are used is even more serious. Much data is available describing costs: per credit hour, per FTE student, per degree produced, and so forth. But little is said in these studies about what students actually learn, the raison d'etre of education. With this abundance of cost data readily available, there is a noticeable tendency to use the "lowest common denominator" method leading to the demise of an educational program. However, expediency-based solutions to complex problems will not suffice.

There is much concern among the general public, state officials, parents of students, and students themselves that something is wrong with higher education. They ask why college costs so much and what are the benefits of study. Some even suggest that colleges seem to know the cost of everything and the value of nothing: for few, if any, institutions can convincingly demonstrate that their educational programs have important impacts on students. In fact, most institutions cannot provide accurate and meaningful information that goes beyond such familiar measures as grade point averages, Graduate Record Examination scores, and cost per credit hour. Higher education's public demands better. Our major challenge is to build evaluation frameworks that first of all spell out various effectiveness measures and then relate cost data.

Undergraduate teaching institutions have a particularly great need to demonstrate results. Institutions classified in this group are the community colleges, independent junior colleges, small liberal arts

colleges, state colleges, and nontraditional colleges. With the exception of the community colleges, all have faced severe fiscal difficulty in the late '60s and early '70s and sometimes reacted with a lowest common denominator approach. The undergraduate teaching institutions must learn to link educational assessment with meaningful cost data so they can plan in a way that will improve their educational programs; attract rather than lose students; and stop, slow down, or compensate for waning public support.

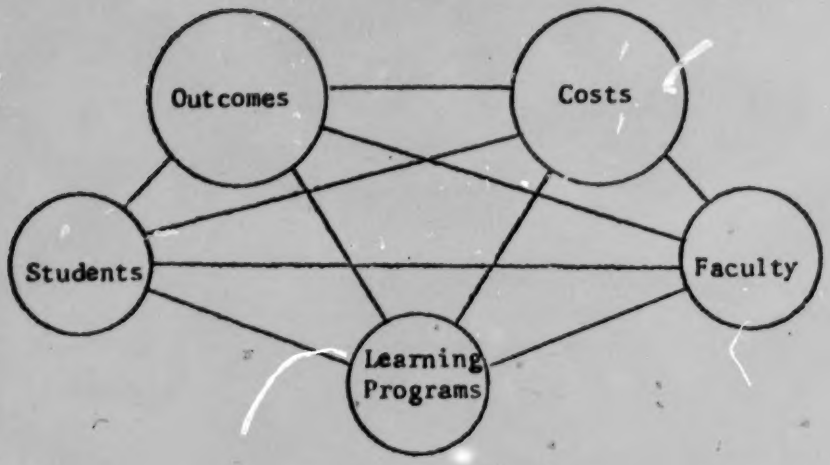
This section briefly describes the Program Effectiveness and Related Costs (PERC) framework being developed and implemented by the Office of Research and Evaluation at Empire State College of the State University of New York and being adapted by State University of New York College at Plattsburgh, University of Wisconsin at Green Bay; Northland College, Ashland, Wisconsin; Hampshire College, Amherst, Massachusetts, New York Institute of Technology; and other institutions too. PERC takes seriously the problem of marrying effectiveness and cost efforts into a coherent, powerful and integrated package which can be adapted to any undergraduate teaching institution. PERC may or may not help lower costs or improve outcomes, but it will certainly provide data for better informed decision-making.

A FRAMEWORK FOR INTEGRATION: PROGRAM EFFECTIVENESS AND RELATED COSTS

What the weaknesses in available studies lead us to propose is a program effectiveness (See Glossary) and related costs strategy which focuses on the master question - <u>what kinds of students working with what kinds of faculty in what kinds of learning programs change in what ways at what cost</u>? (See Figure 2)

Figure 2

The Five Elements of PERC



The first component of this framework is outcomes. Each college must identify its own set of outcomes appropriate to the kinds of students it attracts and the kinds of educational programs it offers. Colleges must specify what their students are trying to attain, what the college is trying to achieve, and what kinds of learning programs will produce these outcomes.

At Empire State we start by defining outcomes based on student needs and objectives. Each student designs an individual degree program which provides the basis for measuring outcomes. The degree program is the individual program of the student, which includes prior learning and contract learning, with the appropriate mix of concentration and general learning. It is the basic planning document for the student's work at the College.

The PERC framework classifies individual student objectives into eight outcome categories. These categories are substantive knowledge, communication skills, cognitive, developmental, personal, occupational, public service and unanticipated. To illustrate, substantive knowledge is the level of competence achieved within the context of a student's goals; cognitive outcomes include comprehension, analysis, evaluation, synthesis, and application; and developmental outcomes cover interpersonal competence, awareness, clarifying purposes, self-understanding, and self-consistency. We think this classification of outcomes is comprehensive and includes most key dimensions across different institutional types. Individual institutions may, however, select their own set of particular outcomes and measure them in ways suitable to their educational program. For instance, the University of Wisconsin at Green Bay is studying these outcomes but also adding other objectives that are directly related to that University's concern to develop skills in solving environmental problems.

Turning to the cost area, there are essential features of the PERC cost framework that differ from other cost systems. First, it has been developed to supplement the educational effectiveness framework: cost data is developed around and reported in relation to the educational effectiveness measures. Second, the framework is triggered by the individual student's learning experiences rather than by some budgetary formula (for example, FTE students or credit hours). Third, the framework requires the inclusion of certain costs that are optional or missing in other systems (for example, in-kind contributions of services, facilities, materials and programs). Fourth, PERC treats the cost of

the development of locations, learning resources and programs as deferred assets. Fifth, portions of faculty salaries devoted to administration are assigned as overhead, not as direct instructional cost. At Empire State, average salaries are calculated across organizational units of the College in order to minimize peculiarities in age, rank and salary of staff at a given location.

Although the PERC framework differs from other cost systems in the above ways, the framework has been constructed so that reports may be comparable with most other cost frameworks, including the major efforts of the National Center for Higher Education Management Systems (NCHEMS), (Debus, 1974). By summing the appropriate individual student costs developed through PERC, reports can be based on more conventional cost analysis units: FTE, credit hours, major and so on.

Thus, the conceptual framework one chooses sets many conditions regarding the data collected. In addition, a multiple perspectives strategy is an essential feature of PERC. This is discussed in the next section.

A MULTIPLE PERSPECTIVES STRATEGY

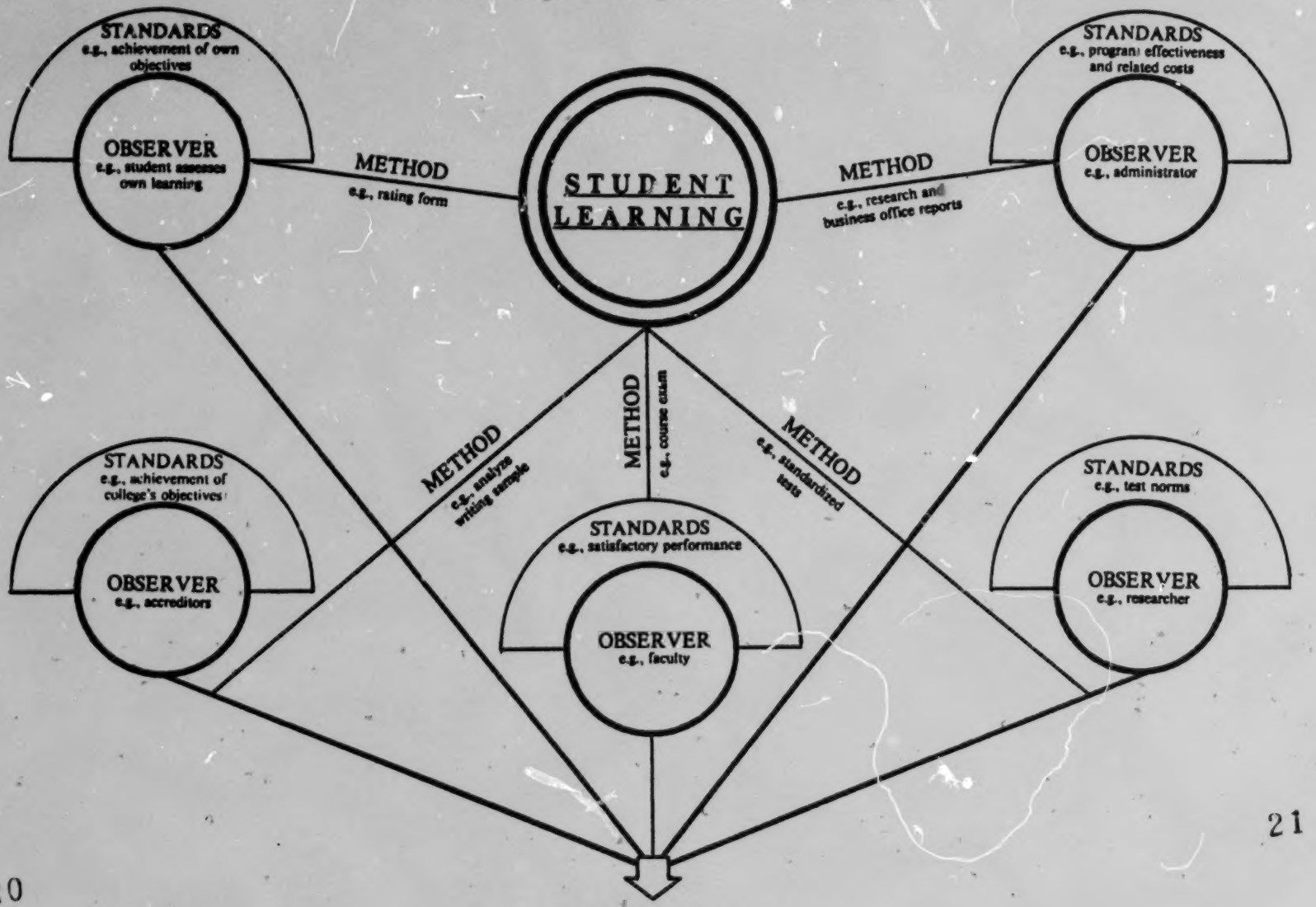
Many studies are reported which use a single type and source of data - e.g., standardized tests to measure student learning. Research on complex problems like student learning and the link between programs and learning belies unidimensional or single-perspective research. PERC offers a different and stronger approach. The multiple perspectives strategy developed for the PERC framework rests on five components: multiple observers of student learning, multiple methods of assessing

student learning, multiple standards for evaluating student learning, multiple decision-makers utilizing data relevant to the policy questions they face, and multiple time-periods for measuring change in student learning. The multiple perspectives strategy is shown in Figure 3. It contains three key ideas: first, student learning is the focus of PERC evaluation - thus its placement at the center of the figure; second, several observers make judgments of student learning utilizing various ways of knowing and ways of evaluating. This array of observers and methods to detect student learning and growth is critical to the pluralistic idea of evaluation in PERC. Finally, an independent or neutral research and evaluation staff synthesizes the data and prepares policy oriented reports for different decision-makers. Reports tailor-made to particular decision-makers' needs maximizes communication and program improvement, as based on research data. PERC's aim is clearly to enhance executive decision-making capabilities.

Let us consider in more detail the various parts of the multiple perspectives strategy in Figure 3. PERC conceptualizes the learning/teaching process as complex, interactive and unique, but also as patterned. For example, the student is the primary consumer of the teaching/learning process and is in an especially advantageous position to evaluate certain aspects of his/her own learning. The student, as an observer, has a strong interest in assessing his/her own learning. Thus, a student may evaluate his/her own learning on certain outcomes, such as subject matter knowledge, communication skills or interpersonal competence.

Figure 3

PERC'S Multiple Perspectives Strategy



Correspondingly, faculty, as observers, can also evaluate students on the same outcomes and provide another perspective on what students have or have not learned. As a result of this strategy of both student and faculty evaluating a given student's learning, we expect to find some agreement on outcomes (especially cognitive ones) but also some differences in outcome judgments (especially in the developmental domain). Relatively few studies have been conducted which apply a multiple perspectives strategy wherein several observers provide independent evaluations of a given student's learning and growth (See Wilson and Gaff, 1970; Wilson, Gaff and others, 1975; Sagen, 1974; Blackburn and Clark, 1975). The multiple perspectives strategy posits, then, some common areas for outcome evaluation that should be reflected in the various data collection methods used, as well as certain unique evaluations that may reflect the particular educational vantage point of the observer.

Other observers of learning outcomes shown in Figure 3 are the research office, the administration and outside evaluators such as accreditors. The research staff using PERC may conduct its own evaluation of student learning (for example, use standardized tests to measure student mastery of subject matter knowledge) as well as provide the focal point for carrying out the PERC framework. In this capacity, the research staff has the responsibility to bring together data provided by several observers, analyze the data and prepare reports that can be of use to different decision-makers.

Administrators and outside-the-college observers look at student learning from a different vantage point. Generally, they are removed from direct participation in the learning/teaching process but may periodically interview students and faculty to question how learning is occurring. College administrators rely upon research and business office reports as the primary source of information from which they can judge program effectiveness and related costs. Outside-the-college observers, such as accreditors, state officials, national agencies and so on, examine the question of student learning in terms of the college's objectives and certain performance standards held by accrediting agencies or governmental bodies. For example, accreditors (through the institutional self-study process) investigate the conditions of education at a given college and provide an evaluation of student learning in the context of overall college operations.

To sum up, student learning and growth is a complex process, so reliance on a single observer, a single method of data collection or a single standard of evaluation is inadequate. PERC employs a multiple perspectives strategy which requires several observers of student learning, several methods of data collection regarding that learning and several standards of judgment to determine the effectiveness of that learning. This strategy has important consequences for data management. For example, working with survey questionnaires data is one thing, working with interviews or documents is something else. And the opportunities to link programs to outcomes is much different when researchers have several kinds (rather than one kind) of data. These points are developed further in subsequent chapters.

CHAPTER 2

DATA MANAGEMENT PLAN

The basic strategy in PERC analysis is to reduce the complex, diverse types of data into forms understandable and meaningful to multiple audiences. This chapter describes some of the optional ways to look at the relationships suggested in the PERC framework, some tactics for research analysis, and some illustrative analyses. The choice of analysis strategies should depend largely on policy questions facing the institution or program.

ROLE AND IMPORTANCE OF POLICY QUESTIONS

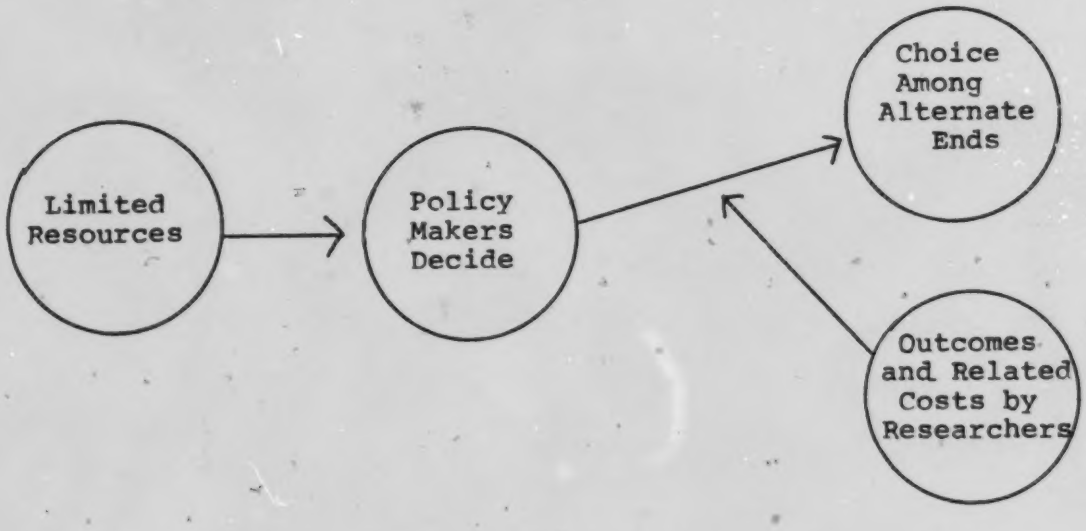
The point of departure for PERC is the statement of a policy question which is conceived here as an inquiry by executive administrators about basic patterns of structure and operation of educational organizations. Examples of policy questions might include: What is an appropriate level of student attrition at this college? What should be done about the documented upward drift in average course grades of undergraduates? What should be the role and function of tutors in educational programs? What should be the composition and diversity of the institution's student population? It is important to note that the literature in the area of policy analysis is ample. However, precision about what a policy question or policy analysis is remains rather vague. One recent attempt at definition and illustration is worth noting. Weathersby and Balderston wrote the following in 1972:

> Policy analysis...uses decisions as the major organizing principle instead of activities. In higher education, these decisions might be student admissions, tuition, faculty staffing, library acquisitions, new construction, or new academic program development, among others. The approach of policy analysis is to bring careful analysis to bear incrementally in specific decision problems and build a planning and management "system" on a case law or precedent basis.
>
> A policy analyst begins with the necessity for decision, identifies the variables relevant to the decision, seeks the relationships between the variables, examines the values associated with the outputs of consequences of the decision, evaluates alternative strategies characterized by different specifications of the control variables...and designs decisions, implementation, and evaluation processes...(for) ...the decisions of an administrator.

Policy questions appear to share several of the following: (1) Oughts/shoulds - implied, if not explicit concern about what ought or should be the shape and function of key organizational activities; (2) Broad questions - the scope and comprehensiveness of the items being considered has the potential to effect many persons and procedures within an institution; (3) Administrative/leadership - persons dealing with policy questions are often, although not exclusively, executive administrators and/or others designated to look at big matters or topics; (4) Disagreement - often times disagreement exists among responsible people about desired policy, outcomes and directions, and (5) Current/practical - policy questions concern processes and procedures which have the potential to affect the day-to-day operation and conduct of educational institutions.

This attempt to clarify the characteristics of policy questions leads to a discussion of research and its role in relation to policy

questions. The College's Office of Research and Evaluation plays an important role in policy questions and discussions. Researchers provide technical information about alternate ways to achieve ends and related costs. They give this information to those persons who are legally accountable for an institution's effective functioning, i.e., the policy makers. This conceptualization is described as follows:



Thus, the main function of research, in this conceptualization, is technical, not evaluative or normative. This is a more-or-less familiar view of the research role in policy decisions. Reality often differs from this "clean" conceptualization. In fact, decision-makers, i.e., executive administrators in educational institutions, often rely on researchers to go farther than simply reporting findings. Decision-makers often ask: Based on what you now know, (after all you have thought about the issue more than I), which course of action do you recommend? It is our position that it is legitimate for researchers to offer their best to answer this question. It does not free the policy-maker of his legal responsibility, but offers advice.

RELATIONSHIPS IN THE PERC FRAMEWORK

The PERC framework (see Figure 2) suggests that outcomes and costs are interrelated with types of students, faculty and programs. The goal informing this framework is to learn what kinds of students change in what kinds of ways following what kinds of programmatic experiences working with what kinds of faculty and at what costs. Building on this basic approach, there are four levels of data analysis. Each focuses on the outcome/costs relationship and progressively introduces information about students, faculty, and programs so that impact of these dimensions can be analyzed separately or in combination. Each analysis level in PERC suggests various policy questions pertinent to executive administration. Many of the illustrative policy questions identified below provide important data and information for faculty too.

Level I: Outcomes-Costs

The most basic level of analysis of PERC is an examination of the relationship between outcomes and costs. The effects of different student, faculty, and learning program activities on the outcome/costs ratio are not examined in this level of analysis. Illustrative questions for Level I analysis are:

1) Does the type of outcome vary by average experience costs? (See Glossary). Does the average change for the various outcome measures - satisfaction scores for personal goals, results of standardized tests, cognitive and affective scores from rating forms, and so on - vary by the average experience costs? Note:

a total average experience cost can be computed from mentor (See Glossary) costs, tutor (See Glossary) costs, course costs, overhead costs, and so on, but a total outcome score cannot be computed since the different outcome measurements are not additive. For example, in one recent ESC study, cognitive and affective change scores for 50 graduates was 2.1 on a nine point scale and the average experience cost was $1303. The current FTE budget cost per student is $2136 but there is no corresponding outcome measure available. PERC data begins to fill this void.

2) Does the type of outcome vary by variations within the type of costs?

What explains the differences in costs across outcome types? What is the pattern of costs associated with each outcome type? Average experience costs for different outcome types will contain different combinations of mentor costs, tutor costs, module (See Glossary) costs, course costs, and so on. Although a study of outcomes and costs under Question 2 has not yet been conducted, some relevant experience does exist. In comparing the educational outcomes for half-time and full-time students on four outcome measures, no significant learning differences emerged, but differences in costs were found. These cost differences were explained by the length of time in the program and use of tutors.

Level II: Outcomes-Costs-Students

This level of analysis adds student characteristics so that the analyst can examine how the program outcomes-costs relationship is influenced by different students and student characteristics. The simplest student groupings are based on age, sex, amount of prior learning (See Glossary) and so on. But students can also be categorized as "beginners", "achievers", and the like. Such classifications are subtle and complex but can lead to useful comparisons.

1) Do certain students learn and change more than others?
Do "achievers" and "persisters" gain more in intellectual and personal skills than other student types? Do full-time students learn and change more than part-time students? How much learning or change occurs for students who study a minimum time (e.g., six months) versus those students who spend significantly longer (e.g., one or more years) with the institution?

2) Do the costs of education vary by student characteristics?
Do some student types cost more to deal with than other student types? Do some students, because of their rich backgrounds and special interests, place unusual demands on colleges and hence run costs up significantly? Are there significant cost differences between independent (i.e., can work along) and dependent (i.e., require much personal support and guidance from faculty and others) students?

3) Do individual student characteristics affect the relationship between outcomes and costs?
How do students with "rich" academic backgrounds and experiences affect the costs to achieve certain educational outcomes? Is the relationship of costs to outcomes influenced by part- versus

full-time status, younger versus older student, independent versus dependent learners, and so on?

4) Does the relationship between outcomes and costs vary for different types of students?

What costs and outcomes are associated with various student types? For certain student types, are some outcomes (e.g., personal autonomy and goal clarification) achievable at less cost than other outcomes (e.g., comprehension, critical thinking, or communication skills)? Are certain educational and personal outcomes more likely to be achieved with some but not other student types and at what costs?

Level III: Outcomes-Costs-Students-Faculty

Analysis at this level involves consideration of faculty variables (e.g., individual characteristics like age, sex, and prior academic experience and various ESC faculty roles such as "tutor" or "facilitator") and assessment of their impact on the outcome-cost relationship. Illustrative questions for Level III analysis are:

1) How important is the match between student and faculty characteristics in promoting student learning and development?

Does learning vary by type of student/faculty match? Are certain matches more productive (greater outcomes) than others? What about cost variations across different matches? For example, some research findings suggested that student and faculty have distinctive learning/teaching styles. Placing students who desire independence with faculty who

foster self-directed learning is one way of matching students with faculty that can facilitate effective learning and growth.

2) Do certain faculty obtain better results with their students?

Do "facilitators" tend to get more and stronger student learning and change than "tutors"? Are younger faculty more effective with students than older faculty? Do tenured faculty turn in better results with students than non-tenured faculty? Are faculty in certain units or departments generally more effective with students?

3) What is the relationship between faculty characteristics and costs?

Do "tutors" cost more than "facilitators"? Are faculty in certain units or departments generally more expensive? Are faculty from certain academic backgrounds more likely to employ costly learning resources?

Level IV: Outcomes-Costs-Students-Faculty-Programs

Level IV analysis is the most complex since it includes all five concepts and all possible relationships among them. This level of analysis may not be achievable for some time. Using this analysis, one can answer a rich variety of program effectiveness and related costs questions. The addition of programs (See Glossary) makes it possible to examine the effects on outcomes and costs of such factors as the learning site, student/faculty relationships, use of learning modules, courses taken at other institutions, and the like.

Illustrative questions for Level IV analysis are:

1) What is the relationship between faculty and programs?
Is there a significant relationship between faculty background (e.g., older, more traditional, conservative) and type of learning activities (e.g., one-to-one lecturing) prescribed and practiced with students? Are faculty who have significant non-academic work experience more likely to reach beyond themselves to identify and use various community resources in student learning programs?

2) Do certain programs (learning activities) achieve more and stronger student learning and development outcomes?
Which educational activity produces the best results - tutoring, independent study courses, courses taken at other institutions, field study, work study, internships, learning modules, and so on?

3) What is the relationship between programs and costs?
Is it more or less expensive to provide education via Empire State learning centers versus learning units (See Glossary), directed studies versus contract learning, using many tutors versus other types of resources? At other institutions, is it more expensive to produce a graduate of one department than another?

4) What kinds of students change in what kinds of ways, following what sorts of learning experiences, mediated by what kinds of institutional arrangement? What are the differential costs of these student learning experiences?
When this primary research question is answered, educators will

be able to understand more clearly and precisely what it takes to achieve maximum learning and development for students with diverse backgrounds, interests, resources, and motivations.

These, then, are the four basic analysis strategies for PERC as it is conceptualized and presented in the PERC Handbook. Level IV analysis provides opportunity for highly complex and rich studies. The varieties of data needed for such outcome-cost analyses include individual characteristics and typologies of students, faculty and programs. The following subsection discusses some of the tactics used at Empire State in dealing with the many data reduction and analysis questions.

TACTICS IN PERC ANALYSES*

The phrase "data-analysis tactics" refers to the processing of quantifiable data. Throughout the PERC Handbook, a multiple perspectives strategy is suggested which produces chains of quantitative and qualitative evidence and reports are made in forms understandable to multiple audiences. Here are some suggested options for handling diverse data.

Step 1: Identifying the Function of Variables. A range of questions is being asked of the many PERC respondents. Each piece of data can be considered a variable for analysis. So the first analysis step is to decide what will be the function of each variable. Variables can have one or more of three functions: classification (which separates groups of subjects for further analysis, e.g., by sex, age), description

---

* We are indebted to Dr. John Bruce Francis (State University of New York at Buffalo) for his consulting services and written report regarding the data analysis strategy described here.

(which elaborates and clarifies relationships), and outcome (which helps describe the achievement of goals). A given variable can be a descriptive variable from one perspective and, say, an outcome variable from another. For example, if a student's score on a test of intellectual competence at graduation is used in an analysis of cognitive achievement, it is an outcome variable. If the focus is on understanding student growth, it would be a descriptive variable. To make full use of the three functions that variables may have, PERC recommends that each variable be specifically evaluated in terms of the function to be served before conducting any other types of analysis.

Step 2: Reducing Data. After administering the various PERC instruments, the responses should be coded for computer entry. Empire State coding instructions for each of the instruments in Chapter 3 of the PERC Handbook are available from the Office of Research and Evaluation. Other recognized coding styles are equally acceptable.

After coding and preparing data for computer processing, the computer file needs to be edited which involves four steps:

1) Initial analyses--generation of means, standard deviations, and percentages for each variable. (Statistical Program for the Social Sciences, available from the National Opinion Research Council University of Chicago, is the package currently used at Empire State for these and subsequent analyses. Other packages are acceptable). Initial descriptive reports can be made at this point and are often useful.

2) Handling missing data - several methods are described in various statistical books. But since PERC is primarily multivariate in concept, simply substituting the item mean on continuously coded (scaled variables) is recommended. This helps maintain a maximum number of cases for later complex multivariate analyses. If a variable is coded dichotomously (0 to 1), the missing data coded as zero is automatically ignored.

3) Removal of variables with low variance - if 95-100% of the respondents choose the same response, the item is not discriminating and should be removed. It cannot be meaningfully related to other variables. If, however, responses seem to reflect true homogeneity of feeling (e.g., 99% of faculty really do read the newspaper), this may be a powerful aspect of the descriptive reports of marginals.

4) Removal of variables with low response rate - if few respondents answered a given question, the researcher may want to eliminate the item from further consideration. Sometimes nonresponse conveys information, however, and this possibility should be considered.

The next aspect of data reduction involves comparing each describer and outcome variable across all levels of the classification variables. Common classification variables include sex, location, age, and so on. One procedure is to use cross-tabulations and show the proportions of responses. Another procedure, which works well on all continuous-scale and dichotomous-coded variables, is to use analysis of variance to detect group differences. Again, the PERC strategy of describing the outcomes-costs relationship makes the descriptive and data-reductive uses of analysis of variance appropriate.

At this point, two other types of assessments useful in general reports can be made: profiles of each classification group and univariate descriptions of group differences. By making a table of F-ratios (an outcome of analysis of variance), one can also decide which variables can be removed in later multivariate analysis on the basis that they do not help distinguish among groups. Such data reduction is difficult from a cross tabulation table.

After this univariate data reduction step, two further types of data reduction techniques are useful. One is scale construction by a priori weighting, which is used when several items relate to a common theme. For example, several items asking about satisfaction might be weighted with +1 or -1 depending on the direction of agreement. Adding up the total gives a satisfaction index for each respondent.

Another data reduction technique is factor analysis (Cohen, 1968). Actually this term describes several procedures each with its own procedures, rules and uses. All share the role of reducing a set of variables to a smaller number of linear functions that account for the variation in the variable sets. Before using the technique, it should be studied in a statistical book, for example, Statistical Programming for the Social Sciences (SPSS), (NIE, Bent and Hall, 1975). But here are some suggested basic steps in factor analysis:

1) Separate the variables into sets that appear, from previous analyses, to relate. As a general rule, there should be four times as many subjects as variables in any given factor analysis.

2) Perform a principal factors (in SPSS, PA 2 option) factor analysis using either quartimax or varimax rotation on all factors with an eigenvalue exceeding 1.0.

3) Select as important contributors to a factor all variables whose correlation with a given factor (factor loading) exceeds .50.

4) Place the above variables together and try to identify the construct that they together represent (e.g., satisfaction, achievement, orientation, etc.)

5) Construct a new variable (in SPSS using varialbe transformations) that consists of the weighted algebraic sum of all variables included in the earlier construct. Weights should be assigned as +1 or -1 depending on the sign of the factor loading.

6) Substitute the newly constructed variables for the original variables in the set. These can now be used in analysis of variance to determine their discriminating power.

The constructs from factor analysis or a priori weighting can easily be described in presentations to any audience. For example, a student type might emerge from factor analysis. Description merely expounds on the variables on which the factor is built.

Step 3: Multivariate Analysis. The previous levels dealt with only one variable at a time. Even though the scale construction and factor analysis sections spoke of grouping several variables, the results were new single scale scores, which are interpreted singly when entered into analyses of group differences. Step 3 describes a method for dealing with the relationships among many variables, which may come from several research instruments over time in preparing descriptive analyses. It is especially useful in relating the different types of data into chains of quantitative evidence. This subsection does not present much depth. For that, one should consult a recent statistical book (e.g., Tatsuoka, 1971) since older ones do not present such techniques as multiple discriminant analysis.

Multiple discriminant analysis, the recommended technique for PERC, is essentially a combination of factor analysis and analysis of variance. Its primary function is to assess group differences in multivariate terms. That is, a group of variables is analyzed in such a way that one or more linear functions (regression equations) are generated. These functions are uncorrelated with each other and maximize the difference among categories of a classification variable. In brief, here are the procedures for multivariate discrimimant analysis:

1) Define the groups on which to differentiate.

2) Choose the variables to be included. The number of variables should not exceed the number of subjects in any one classification group.

3) Run the discriminant analysis.

4) Find the number of discriminant functions that are significant. This means that the groups are significantly different when all variables are considered.

5) Find the discrimination power of the discriminant function. This step tells how much variation in the variables can be predicted by knowing to what group they belong.

6) Find the group centroid (analogous to a mean) on each discriminant function.

7) Look at the factor loadings on each discriminant function. These are simple correlations between each variable and the discriminant function. Those that correlate highly best describe what the function means.

To recapitulate, a variety of analysis levels is suggested that combine and reduce data while allowing descriptive reports at any time. Because the outputs of each analysis can be put into straightforward descriptive terms, the data should be understandable and meaningful to anyone even though the analyses themselves are complex.

INTEGRATING ANALYSES IN PERC

Although the options presented in the section above will help in reducing the complexity of the various types of analysis in PERC, major challenges remain. One is integrating quantitative with qualitative findings, a vital aspect in establishing chains of evidence, or patterns of related information which can be used to establish causal linkages between student characteristics, program activities and educational outcomes. Traditional research design approaches to causal analysis

have several limitations and are often impractical. A major problem is control, being able to precisely vary the experimental variable and hold everything else constant. The approach, ideally, eliminates all "extraneous noise" from the design. But in reality, the ideal is significantly different from the actual situation. In addition, it is difficult to establish appropriate comparison and/or control groups to study the effects of educational experiments. People do not want to participate...they do not see the point of their participation; the instruments (say, standardized tests) are not relevant...they do not measure important experiences and learnings reported by students; and, attrition rates of 60-75% reduce a student class so drastically over the program that initial sorting and matching to build comparison samples is seriously hampered. This latter observation is a highly significant "condition of life" which limits the utility of longitudinal research designs in educational research.

The analysis tactics discussed earlier in this chapter will apply to quantitative data only. Thus, case-study findings must be introduced to explain the various changes and relationships found (See Palola and Bradley, 1973, for illustrations of case analysis used at Empire State).

The essential elements of case study analysis include: heavy reliance on documents, interviews, informal observation, and site visits for direct conversation and discussion; light use of standardized tests, survey questionnaires, and rating forms; and, a kind of sophisticated investigative journalism where various types of information are evaluated and written up to produce an interesting, accurate and detail-rich narrative report on the personal experiences of individual students.

Good case studies are based on solid observation and sophisticated investigative journalism. For example, a quantitative finding might be that students improve in ability to write when they study with certain faculty members. Why? Perhaps the interviews will discover that these faculty work with students in special ways (e.g., perhaps these faculty require complete rewrites of all papers that have even minor errors in logic or grammar). Without the quantitative instruments, PERC might not be able to demonstrate growth. Without the qualitative techniques explanations for the growth might be difficult to find. Thus, integrating quantitative and qualitative techniques is an essential part of a full analysis.

Another integration problem is caused by the longitudinal design. While the multiple discriminant analysis should help relate entrance data with that developed later, it is no panacea. Again, the qualitative information gotten throughout a student's career will be essential to creating chains of evidence. PERC is not, however, an exact science. Integrating the analyses from the various stages in a student's career will require a fair amount of intuitive feel for both the data and the institution. Part of the multiple perspectives approach, multiple evaluators, should be of some assistance here. The research staff has the responsibility to bring together data provided by several observers, analyse the data, and prepare reports which can be of use to various decision-makers.

The next section demonstrates some of the analysis dimensions discussed in this chapter by using illustrative data from the Empire

State Mini Cost Effectiveness Study (MCES) (See Glossary). The MCES focused mainly on Level I (outcome-cost) analyses while exploring the multiple perspectives strategy. Analysis tactics were fairly simple, essentially Step 1 and part of Step 2. The aim was to look at data on a modest sample of students to show how policy implications can be uncovered by PERC. The following section presents the data and some analyses.

ILLUSTRATIVE ANALYSES FOR POLICY QUESTIONS AND PERC

Major analysis questions, given all of the options, are what to analyze and to what end? PERC suggests a policy analysis approach since a primary purpose of the framework is to inform decision-making.

The Mini Cost Effectiveness Study (MCES) provides an opportunity to demonstrate how data collected under the PERC framework can be brought to bear on policy questions. In order to achieve this objective, we decided on a research strategy that was essentially post hoc in design. The basic longitudinal design of the PERC study could not be tested in the MCES because too much time would be required to follow students from time of entry to graduation. Therefore, we selected recent graduates to reconstruct their learning experiences.

Fifty recent graduates (as of summer and fall 1974) were selected on the basis of two criteria. First, the graduates were to be equally chosen from the Learning Centers and Learning Units. Second, they were to represent three areas of study only - the arts; community and human services; and business, management and economics. With this research design established, we identified a policy question selected

from the many possibilities to illustrate the use of data in a policy framework.

Student Mix in a College

A question that concerns the students, faculty and administration of every college is the composition of the student body and the effects of that mix on student learning and costs. A common institutional research response to the question of the current mix of the students on a given campus is to report the demographic characteristics of the students. Such reports usually include age, sex, marital status, socio-economic status, and geographical origins of students (Feldman and Newcomb, 1969). In PERC research other variables that affect student mix are added to the more standard ones. These variables include place bound versus mobile, half-time versus full-time, and different areas of study. The PERC framework not only provides the statistics that describe the mix but also provides a way to link outcome data and related costs to the factors that affect composition of the student body.

Student Enrollment Status (Full-time/Half-time)

The effect of student enrollment on outcome change and cost has been a question debated in Empire State College for several years. Effectiveness arguments have been made for either side of the issue. The case for the full-time student has been articulated: full-time students should be able to complete their degree programs in a shorter period of time and should be able to obtain the educational benefits

of a more intense learning experience. Such concentrated learning therefore leads to greater outcome change.

Advocates for the half-time student argue that learning contracts can be spread out over a longer time period allowing the student to absorb gradually his/her learning and critically reflect on his/her education. Since the majority of students carry heavy job, family, and other responsibilities, half-time students are in a better position to accommodate and integrate contract learning with their daily lives. Proponents of this line of reasoning contend that contract learning for half-time students will have a greater and longer-lasting impact than for full-time students.

From a cost standpoint, half-time and full-time students were expected to cost about the same as they completed their degree programs. There are, however, some pressures for a student to study full-time. For example, full-time students may obtain some financial aid supports (e.g., Tuition Assistance Program) that half-time students do not. Such financial aid supports provide strong incentives for low-income students to study full-time even though their other commitments may make such a study load impractical. This overcommitment may in turn result in those students taking longer to complete the program, thus offsetting some of the financial aid provided.

In order to test out the merits of the full-time/half-time argument with the MCES graduates, we first sorted out the learning contracts by enrollment status and then classified the graduates into appropriate categories. A summary of the outcome and cost findings for the graduates' enrollment status is shown in Figure 4.

Before discussing the data in Figure 4, a few comments should be made about the format of the table and the manner in which the data is displayed. The PFRC framework adopts a multiple perspectives strategy for assessing outcomes and related costs. Four different evaluation techniques are displayed in Figure 4: student ratings of outcome change, mentor ratings of outcome change, tutor ratings of outcome change, and the Office of Research content analysis score of contract learning. Each of these evaluation techniques has the related costs (experience and monthly, see Glossary) calculated for the number of graduates involved. Thus, the data is organized for each variable introduced (e.g., enrollment status) so that comparisons can be made across the evaluation techniques. Finally, tests of statistical significance were run for both outcomes and experience costs so that the reader can easily determine the most important findings.

The basic finding, as presented in Figure 4, is that there is no significant difference generally regarding outcome change for full- or half-time students but that there is a significant difference regarding average experience costs: full-time students cost approximately $200 to $250 more than half-time students.

On examining the student, mentor, and tutor ratings, we find no difference between full-time and half-time students. For the content analysis scores, however, half-time students scored significantly higher than full-time students. All 50 graduates were included in this scoring judgment and the content analysis process was checked to insure high reliability. It is significant that the content analysis scores, which

were generated by a different research technique from the rating strategy, has in fact produced an important secondary finding to the major finding cited above.

In reporting the costs of the outcome changes, two different methods - average experience and average FTE month - were used. It is important to an understanding of PERC to know that Empire State's flexible academic calendar permits a student to graduate with a minimum residence of eight months (providing there was a maximum advanced-standing award of 24 months) or can take as long as 32 months - the equivalent of four traditional years (with no advanced standing).

In a more traditional setting, cost reports are generally related to a uniform and standardized academic calendar and costs are displayed on an annual basis. The flexibility of the ESC program requires that reporting be done on a learning experience basis. Therefore, the average experience costs for MCES graduates shown in Figure 4 are for the entire length of experience at the College. They are not the equivalent of a traditional college's annualized cost figures. The average experience cost is the result of adding all costs attributed to the learning experience of each student in order to complete his/her degree. With grouped data, the average experience cost refers to all the costs incurred by a group of students divided by the number of students in that group. For example, the 29 full-time students had an average experience cost of $1369.

There is a rather consistent $200 difference in the average experience costs across all four evaluation techniques between full-time and half-time students. Full-time students cost more in large part because full-time students take one and one-eighth more months

Figure 4

Summary of Outcome and Cost Findings for MCES by Enrollment Status (FT/HT)

STUDENT RATING

Enrollment Status	N	Mean Change	Avg. Experience Cost **	Avg. FTE Monthly Cost **
Full Time	29	2.1	$1,368.78	$190.78
Half Time	14	2.1	$1,169.24	$190.34
Total Cases	43	2.1	$1,303.51	$190.65

Significance Outcomes t = 0; d.f. = 41; p = N.S.

Significance Costs t = 2.25; d.f. = 41; p = S*

MENTOR RATING

Enrollment Status	N	Mean Change	Avg. Experience Cost	Avg. FTE Monthly Cost
Full Time	26	2.1	$1,394.94	$190.89
Half Time	14	1.7	$1,177.98	$191.76
Total Cases	40	2.0	$1,319.00	$191.16

Significance Outcomes t = 1.25; d.f. = 38; p = N.S.

Significance Costs t = 1.98; d.f. = 38; p = N.S.

* All relationships marked with an asterisk were statistically significant at the 0.5 level using the t test. The t tests on costs were calculated only for the average experience cost. S stands for significant; NS for not significant.

**Average experience cost includes all the costs incurred by the student in order to complete his/her degree. The average FTE monthly cost refers to all the costs incurred by a specific student divided by the months of credit received.

Figure 4 (cont.)

TUTOR RATING

Enrollment Status	N	Mean Change	Avg. Experience Cost	Avg. FTE Monthly Cost
Full Time	17	1.5	$1,582.35	$196.35
Half Time	11	1.5	$1,245.11	$201.42
Total Cases	28	1.5	$1,449.86	$198.03

Significance Outcomes	t = 0.12; d.f. = 26; p = N.S.
Significance Costs	t = 2.54; d.f. = 26; p = S*

CONTENT ANALYSIS

Enrollment Status	N	Mean Change	Avg. Experience Cost	Avg. FTE Monthly Cost
Full Time	34	14.4	$1,389.02	$191.20
Half Time	16	17.5	$1,172.85	$191.49
Total Cases	50	15.4	$1,319.84	$191.28

Significance Outcomes	t = 2.00; d.f. = 48; p = S*
Significance Costs	t = 7.58; d.f. = 48; p = S*

*All relationships marked with an asterisk were statistically significant at the 0.5 level using the t test. The t tests on costs were calculated only for the average experience cost. S stands for significant; NS for not significant.

of credit to complete their degree than do the half-time students. For this additional one and one-eighth months of credit, there is no recognizable outcome impact for the full-time student.

The second cost figure included in Figure 4 is the average FTE monthly cost. This figure is calculated by dividing the average experience cost of each student by the months of credit that student received. With group data, the average FTE monthly cost for full-time students, for example, is determined by dividing the total average experience costs for the 29 students by the total average FTE monthly costs for the same students. In Figure 4, the average FTE monthly cost for full-time students is $190.78.

Displaying costs in this way achieves two purposes. First, the FTE monthly cost standardizes the time variable since students at ESC have degree programs of such varying length. The monthly cost figure permits comparisons among different groups of ESC students. Second, the calculation of an FTE monthly cost permits comparison of ESC student costs with annual FTE costs of other institutions since monthly costs can be aggregated easily into an annual figure.

There is a direct relationship, then, between the average experience cost and the average monthly FTE cost since the latter is determined by dividing the former by the months of credit earned. The FTE monthly cost may, however, vary significantly from one student's learning experiences to the next because other variables besides time can influence the monthly costs. Such variables as use of tutors, location, area of study and so on may contribute to differences in monthly cost figures.

It is striking in Figure 4 that the average FTE monthly costs are almost the same across each of the outcome evaluative techniques. This finding suggests that the length of time in the program accounts for almost all of the experience cost differences. The differences in monthly costs almost disappear when the length of time variable is controlled (i.e., standardized for both full- and part-time students). There is, however, a major exception in the tutor rating monthly costs wherein there is a five dollar difference between full-time and half-time students. This is probably explained by different patterns of tutor use and area of study expenses.

Area of Study (Major Concentration)

The next variable that affects the composition of a student body is the area of study or major chosen by the student. Feldman and Newcomb (1969) summarized 40 years of research on student differences by major field of study. This review of research reveals that different fields of study are pursued by students with certain background and personality characteristics. Furthermore, instructional costs vary considerably for students pursuing different fields of study (Meeth, 1974). Given these findings, it is important for colleges to maintain some balance among curricular areas and related costs within the overall educational program and budget. By knowing the distribution of students among areas of study or majors (and how many students change majors), a college can better control through admissions, orientation, and faculty advising, the number of students and appropriate costs to be found in a given area of study.

Figure 5

Summary of Outcome and Cost Findings for MCES Graduates by Area of Study

STUDENT RATING

Area of Study	N	Mean Change	Avg. Experience Cost**	Avg. FTE** Monthly Cost
The Arts	13	1.2	$1,285.80	$205.10
Community & Human Services	14	3.0	$1,389.24	$186.12
Business & Economics	16	2.1	$1,242.91	$184.13
Total Cases	43	2.1	$1,303.52	$190.65

Significance-Outcomes F = 5.28; d.f. = 40.2; p = .01 S*

Signficance-Costs F = .006; d.f. = 40.2; p = N.S.

MENTOR RATING

Area of Study	N	Mean Change	Avg. Experience Cost	Avg. FTE Monthly Cost
The Arts	13	2.2	$1,373.10	$199.44
Community & Human Services	12	2.2	$1,333.34	$189.35
Business & Economics	15	1.7	$1,260.67	$185.39
Total Cases	40	2.0	$1,319.01	$191.16

Significance-Outcomes F = 1.54; d.f. = 37.2; p = N.S.

Significance-Costs F = .33; d.f. = 37.2; p = N.S.

* All relationships marked with an asterisk were statistically significant at the .05 level using the F test. The F tests on costs were calculated only for the average experience cost. S stands for significant; N.S. for Not Significant.

**Average experience cost includes all the costs incurred by the student in order to complete his/her degree. The average FTE monthly cost refers to all the costs incurred by a specific student divided by the months of credit received.

TUTOR RATING

Area of Study	N	Mean Change	Avg. Experience Cost	Avg. FTE Monthly Cost
The Arts	9	1.4	$1,457.63	$188.76
Community & Human Services	9	1.3	$1,541.23	$194.00
Business & Economics	10	1.8	$1,360.60	$194.38
Total Cases	28	1.5	$1,452.56	$192.73

Significance-Outcomes	F = 0.59; d.f. = 25.2; p = N.S.
Significance-Costs	F = .30; d.f. = 25.2; p = N.S.

CONTENT ANALYSIS

Area of Study	N	Mean Change	Avg. Experience Cost	Avg. FTE Monthly Cost
The Arts	17	13.2	$1,357.67	$201.58
Community & Human Services	16	15.4	$1,370.73	$188.25
Business & Economics	17	17.1	$1,234.13	$184.04
Total Cases	50	15.4	$1,319.84	$191.28

Significance-Outcomes	F = 1.87; d.f. = 47.2; p = N.S.
Significance-Costs	F = .56; d.f. = 47.2; p = N.S.

*All relationships marked with an asterisk were statistically significant at the .05 level using the F test. The F tests on costs were calculated only for the average experience cost. S stands for Significant; NS for Not Significant.

Empire State's educational program is different from the traditional college curriculum (i.e., contract learning system, interdisciplinary focus, etc.), and the demographic characteristics of ESC's student body (see Educational Program, 1974) differ from most other student body profiles. The applicability of previous studies to ESC's unique setting was a question for exploration. Therefore, an initial hypothesis was that there would be important outcome differences among graduates by area of study, but the specific links between areas of study and outcome change would be different. To test out in a preliminary way the initial hypothesis, three relatively distinct areas were investigated in the MCES - the arts; community and human services; and business and economics.

A summary of the outcome and cost findings for each area of study is presented in Figure 5. The basic finding is that there are significant differences among some of the outcome measures but essentially no statistically significant cost differences by area of study. For the student rating, graduates in community and human services scored the greatest outcome change and graduates in the arts the lowest. Although the differences in the content analysis scores were not statistically significant, they did show the business graduates scoring higher than graduates in the arts and in community and human services.

FINAL OBSERVATION

Educational researchers are not agreed on the "best" way to analyze data. The PERC multiple perspectives strategy requires that

the mode of analysis be tailored to either a particular audience or decision maker or to varying audiences and decision makers. For example, the same set of data can be analyzed in terms of the effects on students, the effects on faculty, the effects on the college, the effects on the larger community, or some combination of these groupings. PERC has the capability of informing policy decisions from several perspectives depending on the policy questions at stake and the groups most interested in or affected by the decision. The next chapter deals with the topic of instrument reliability and validity. Experiences based on Empire's data are discussed and evaluated.

CHAPTER 3

FORMULATING PERC MEASURING INSTRUMENTS

OVERVIEW: PROBLEMS IN MEASUREMENT

The central question of PERC is "What kinds of students working with what kinds of faculty in what kinds of learning programs change in what ways at what cost?" From the research operations perspective this question implies a requirement for the construction of adequate measures for five concepts: student characteristics, traits of faculty persons, characteristics of various learning programs, student attitudinal and/or behavioral outcomes, and college costs. Each of these variables can develop into a substantial research program. For example, consider educational outcomes. The researcher might focus his attention on educationally-produced changes in a student's substantive knowledge, cognitive skills, self-evaluations, occupational aspirations, occupational opportunities for advancement, interpersonal relations, educational aspirations, use of leisure time, and so on. Obviously, "outcomes" is not a unitary concept. Even "costs" is not a unitary concept since there is a variety of ways of computing costs and each method attends somewhat differently to the elements that make up the expenditure profile. Since every aspect, then, of these five concepts cannot be explored, the first step in operationalizing PERC is to order the priority of the five master concepts and to decide what aspects of each concept selected for research should be formally organized into scales or measures. The second step, of course, is to formulate the measures. At that point, it is possible to deploy the measures as independent (i.e., causal), intervening, or dependent (i.e., effect) variables.

While this section focuses heavily on certain empirical manipulations in the perfection of scales to index student attitudes and behaviors, it is a mistake to undervalue the role of practical experience, sound concepts and coherent theories in handling PPRC variables. For example, if it were known that the kind of students served by a college had changed substantially in a given time interval but costs-per-student had remained constant during that interval, then it is not worthwhile exploring simple bivariate relationships between selected student characteristics and cost factors. If experience shows that costs-to-educate differentials among students are very small, then the cost factor becomes irrelevant from point of view of purely intra-institutional, cross-sectional research. The use of sound concepts is also important. For example, there are standardized schemes for classifying programs (e.g., HEGIS) but these are not very useful conceptually in showing the kinds of educational influences encountered by students. It may be desirable to know if a student's program (1) emphasizes the mastery of specific skills or aims at modification of student attitudes, (2) stresses independent study or group learning, or (3) enables him to meet his instructors in informal settings or not. Such concepts may prove to be useful in tracing out causal influences on student behavior.

Good theorizing is also essential at the point where the research advances beyond the development of measures for variables to the examination of the relationship between variables. Reasonable apriori hypotheses prevent the research plan from being degraded into a random search pattern for statistically significant correlations. Obviously, there is a vast difference between the truth values of apriori and ex post facto hypotheses too.

Theory and measurement interpenetrate in a variety of ways. Accurate measurement of variables enables the testing of theories and good theories are a requisite to the development of valid measures. The depth of this interpenetration is most evident in the advanced sciences. In those fields relatively good measures exist because it is possible to formulate axiomatic theories that account for the operation of measuring instruments and at the same time enough is known about the variable which the instrument measures to ascertain the goodness of fit between measurement operations and variables they seek to index.

In developing measuring instruments for PERC the ideal situation previously mentioned does not obtain. The PERC framework consists of five elements (i.e., students, faculty, learning programs, outcomes and costs) but these elements have many dimensions and the relationship between the elements is imperfectly known. For example, the concept of student - as we have seen - can be split up into a dozen distinct dimensions. At the present time, it is possible to make only gross statements about the relationships among some of these dimensions. Second, the stability of selected variables is not well known. For example, at this time it is impossible to say whether an improvement in a given outcome variable represents the beginning of a steady, upward-curving trajectory or is only a momentary upward joggle around a longitudinally stable path. Third, the system of causal connections between the five PERC elements is also imperfectly known. For example, the faculty is cognized as a major source of modification in student behavior, but at FSC where a strong emphasis is placed on serving student needs, it is likely that determined students can modify the conduct of the faculty with whom they work. Similarly, PERC, for the sake of simplicity, cognizes outcomes as more or less independent of

each other; in fact, it may be that outcomes are linked in a causal way so that changes in one outcome variable require an antecedent change in another. Continuing with the subject of ambiguity in causal connections, consider the concept of costs. In PERC, costs, for the sake of simplicity, are viewed as effect variables. But it is clear that cost numbers have practical maximum values because the college cannot bear any cost to educate its students; costs reflect available financial resources. Fiscal factors, therefore, have causal impacts on the kind and number of students, faculty, and programs which make up the educational system.

These complexities, insofar as they have consequences for the development of research instruments, are compounded by the difficulty social science researchers have in conducting genuine experiments in natural settings. Suppose that one has a coherent theory that purports to explain a relationship between two variables. Measures for the two variables are formulated and a controlled experiment is conducted. If experimentation confirms the predictions made by the theory, the theory gains in truth-status and the measures gain in credibility. Conversely, in the absence of genuine experimental designs directed by coherent theories, the credibility of empirical measures must always be taken - axiomatically - as problemmatical.

All of these facts operate as contingent conditions influencing the utility of measures developed especially for PERC. Therefore, the steps taken to develop these measures must be viewed as modest ones. The point has not been reached yet where one can speak of finished products.

INSTRUMENT RELIABILITY, VALIDITY AND DIMENSIONALITY: CONCEPTS AND METHODS

Traditionally, the minimal requirements for tests and measures (i.e., "instruments") center around the concepts of reliability and validity. These concepts have generated an immense body of technical literature. They are not altogether unambiguous concepts. Still, for present purposes. it is possible to treat the fundamentals of the subject adequately.

Perhaps the clearest notion of reliability is "test-retest" reliability. In that case, attention is focused on the dependability or stability of a set of measurements. Essentially, the test-retest reliability of a measuring device is indexed by the degree of agreement between at least two sets of scores on the same variable for the same class of objects. It is understood as a matter of definition that there is some time interval between the administration of the two tests. Thus, if the same bag of sugar were weighed on numerous occasions and the "scores" habitually varied from (say) four to eight pounds we would conclude that the weighing scale lacked test-retest reliability - all other things being equal.

The significance of this kind of reliability is self-evident in the context of medical research. For example, a medical researcher wants to know if a given drug is useful in reducing excessive body temperatures. He wants to know whether observed before-after differences are due to administration of the drug and he must exclude a competing hypothesis: reliability of the thermometer. Putting the matter somewhat differently, the researcher wants to know how much of the difference between the before-after scores is due to error in the instrument.

It is not always convenient to estimate test-retest reliability by administering the same test on two different occasions to the same persons. An analog to the auto-correlation of a test over two occasions can be obtained by fractionating a single test. Frequently the test instrument is separated into odd and even items and the correlation between these two parts, the split-half reliability, is computed. Traditionally, with odd-even splits, the Spearman-Brown (S-B) formula is used to index the auto-correlation. The fractionation of a single test has certain advantages over two separate applications of a test; in the latter case the second score may reflect memory of experiental factors as well as the trait of interest. On the other hand, split half methods are deficient in empirically determining instrument "decay", the deterioration in the ability of a measuring device to index a trait accurately.

Of course, if a test is split into two parts by a variety of different methods and correlations are computed between the parts, we would expect these correlations to vary. Perhaps the finest degree of splitting occurs if a test of n items is partitioned into n parts. We could then compute a best estimate for the correlation of all the parts. This is the model of reliability which underlies the Kuder-Richardson (K-R) formula (Guilford, 1954). The K-R formula produces reliability and coefficients that are lower than those produced by the S-B formula and makes somewhat different assumptions. K-R assumes that parallel items have equal difficulty and that all the items index one trait, i.e., that the entire test displays "univocality" or factorial unity. This suggests a partitioning of the reliability concept into two related kinds: test-retest reliability and internal consistency reliability. The two types of reliability are related because - whatever

the conceptual differences - the operational measures concern themselves with indexing the degree of equivalence between two or many parts of a test or measure. In this report, the S-B formula is used to estimate the first kind of reliability and the K-R formula 20 is used to estimate the second kind.

A measurement system may be highly reliable in the sense that it produces a set of readings on the same object that has little variance, and still be useless especially if the measure is problemmatical. Suppose, for example, that a weighing scale is proposed as a means to index a person's "predisposition to violence". The use of a weighing scale for this purpose clearly is wrong. The explanation is simple enough: there is no relationship between a person's weight and the trait under discussion. On the other hand, the incidence of personal fantasies involving violence might serve well to index to the trait.

The adequacy of a measuring instrument in indexing a specified trait is referred to under the concept of validity. The validity of a measuring instrument is a variable ranging from low to high. An instrument designed to measure intelligence may be highly valid for a sample of American children but have low validity for French children. An instrument that is valid for measuring a given trait in a certain group may decay with time and become invalid. Finally, an instrument that becomes invalid for one measuring a trait might legitimately be employed later to measure a different trait.

Commonly, one speaks of three levels of instrument validity: (1) face validity, (2) predictive validity, and (3) construct validity. An instrument is said to possess face validity if the instrument - on its face - engages the variable of concern to the

researcher. A questionnaire which purports to measure attitudes towards parents would have face validity if the content of the questionnaire called for an assessment of parental behavior and if there was sufficient reason to suppose that respondents would respond frankly to the questions. Making good judgments of face validity depends to some extent on intuition; it also depends on familiarity with the life-circumstances and thoughtways of the target sample. Predictive validity refers to the ability of an instrument to forecast behavior. A scale that purports to measure marital adjustment and that accurately predicts the incidence of divorce in selected sub-populations of married persons would have predictive validity. Conversely, the scale would lack predictive validity as an index of marital adjustment if it could not forecast the criterion behavior, the incidence of divorce. Concurrent validity is a version of predictive validity. If the data for the predictor and predicted variables are collected on the same occasion and the variables are correlated, the ability of the former to forecast the latter is referred to as concurrent validity. Construct validity is the highest level of validity but, unfortunately, the concept has been explicated in several different ways. As in the case of predictive validity, construct validity calls for the study of the correlation between a given measure and some criterion. In this instance, no single criterion will satisfy the complexity of the initial concept and a variety of predicted variables reflecting diverse but related behaviors is required. Under this conception of construct validity, a measurement scale "passes" if it succeeds in predicting a set of criterion variables. For example, suppose the claim is made that sweating indexes anxiety. If sweating correlates with self-ratings for anxiety, inability to sleep, and with

the presence of anxiety-producing conditions, then sweating has construct validity. A second formulation of construct validity requires that a given method of measurement correlate highly with maximally dissimilar methods for measuring the same trait. Thus, if the observed number of cigarettes smoked per unit time is taken as an index to anxiety and this correlates highly with self-ratings for anxiety, the frequency of cigarette smoking has construct validity as a measure of anxiety. A third version of construct validity requires that the formulation of the measurement take place in the context of sound theory. For example, suppose that we have a straight rigid bar of length y and we obtain another similar bar equal to that length. If we put the bars end-to-end, the empirically observed measure for length will be $2y$. This measurement has construct validity because the relevant physical and mathematical theories are secure and converge to show that this quantity, and only this quantity, can be produced by the operations described.

The methods used and the resources required to develop adequate measures for PERC depends on the degree and kind of reliability and validity desired. The last formulation of the concept of construct validity is seldom attained in social research. Even establishing the predictive validity of a new instrument may be troublesome since the investigator may have to wait for a period of time to pass and must bear the cost of administering a second instrument. Of course, the least expensive but least secure kind of validity is face validity. (In this report, we have worked at two levels: face validity, and concurrent validity). These are practical judgments that have to be made.

Another judgment faced by a researcher deploying PERC has to do with the dimensionality of his measures. A scale or measure is multi-dimensional if it "taps" several aspects of a phenomenon. For example,

a scale that indexes marital happiness might reflect inputs from such diverse domains as sexual pleasure, inter-spousal concensus over major values, health, finances and parent-child relationships. Such a multi-dimensional scale may be highly useful in the empirical prediction of (say) divorce rates. The drawback is that it is hard to be precise about which dimension of the scale is operative. Unidimensional ("univocal", "unifactorial") scales, by definition, measure one trait. Therefore, if unidimensionality is achieved, it is relatively easy for the researcher to answer the question, "What does this instrument measure?" and to understand causal relationships involving the measured variable. However, experience shows that unidimensional scales, while more intelligible than multi-dimensional scales, are usually less useful in practical sorts of research because they are less likely to correlate with other variables of interest to the researcher.

The preceding discussion suggests a possible trade-off between the intelligibility and predictive efficacy for PERC. If a PERC-user had infinite resources there would be no need to consider the question of trade-off. Our own experience suggests that understanding the dimensionality of one's scales, should be given priority over predictive efficacy. Our priority has been intelligibility; hence, we have tried to construct unidimensional measures. (This same line of thought has been pursued at one of our collaborating institutions, University of Wisconsin/Green Bay, by Dr. Bela Baker.) As later sections of this chapter will show, we have not always been successful in that endeavor.

One payoff of unidimensional scales is that it enables the researcher to formulate typologies. A typology represents the intersection of several variables. For example, the two variables of height and weight

can be partitioned into high and low sides and a four-fold physical classification of persons can be formed. Counts on a third variable can be "loaded" into each cell and the differential incidence of the third variable in the four classes can be studied. From a statistical point of view, the use of typologies is wasteful of data especially if the use of the typology involves the conversion of strong measures into weaker measures (e.g., the conversion of cardinal numbers into ordinal numbers). Notwithstanding this drawback, there are gains associated with the use of typologies. Consumers of research reports who are not familiar with statistical methods frequently find typological analyses intelligible whereas they would be baffled by such complex techniques as partial or multiple correlation. Intelligibility feeds into credibility; surely an institutional researcher will want to take that into account.

Two methods were used to explore the dimensionality of certain packages of items taken from PERC questionnaire forms. For preliminary estimates of dimensionality K-R formula 20 has been used; for more exact estimates the technique of factor analysis was used. The K-R formula has already been discussed.

Factor analysis is a statistical technique that is capable of resolving a large number of measurements into distinct patterns. In that sense, factor analysis is a technique for discerning order or structure. For example, suppose that a researcher wished to explore the domain of student skills. Data over a large number of variables is collected: vocabulary, reading comprehension, number of sit-ups per unit time, time to run 50 yards, computational accuracy, probability of "sinking" a basket, etc. In some instances, the inter-correlation

between some of these variables will be low; in some instances, the correlations will be high. Factor analysis scans these inter-correlations and represents them as packages of variables that "go together". In the illustration, if the "physical" activities were inter-correlated and the "mental" activities were inter-correlated but the two sets of activities were relatively independent of each other, the factor analysis would show that the total domain of activities can be resolved into two dimensions: "athletic" skills and "academic" skills. The presumption is that certain variables are inter-correlated with each other because they are correlated with some common, underlying and more general variable, the "factor".

In practice, the neatness of the illustrative problem described above does not obtain. If the overall pattern of basic correlations is low, the resultant analysis will show a large number of factors. In that case, factor analysis cannot reduce the complexities in the original data into simpler, more intelligible patterns. Sometimes the number of factors generated is small enough to grapple with but the variables that coalesce to make up the factors do not make conceptual sense. Finally, under some forms of factor analysis it is possible to isolate factors but the factors themselves can be shown to be inter-correlated in complex ways. To some extent it is possible to make sense of these complicated outcomes if the researcher is able to form sound apriori hypotheses about the most likely structure. In exploratory research - the case in point here - one frequently does not always have such hypotheses; there is, therefore, a heavy reliance on speculative reasoning as an aid to understanding the outcomes of the factor analysis.

There are many kinds of factor analysis. In our research we have used the principal-factor type with orthogonal rotation. A full exposition of these concepts is out of place here. All that needs to be said is that the research reported here concentrated attention on the identification of underlying factors that are statistically independent of each other.

INSTRUMENTATION AND SPECIAL PROBLEMS IN INTER-INSTITUTIONAL COMPARISONS

PERC is a cooperative arrangement. At the present time five small - and medium - size colleges are working together in the development of a common data base and method of data analysis. The ultimate purpose of the consortium is to provide a fund of experience that consortium members can use in trying to maximize educational impacts at reasonable cost levels. Theoretically, the consortium arrangement also provides practical opportunities to test hypotheses for generality. Thus, cost-effective programs which seem to have a strong impact on students in one place can be examined for their utility at other places.

The Research Office at Empire State College has played a central role in the functioning of the PERC consortium. The framework of concepts, the basic data instruments, and the paradigm for analysis were developed at ESC. ESC personnel have consulted at great length with other members of the consortium to help them set up their PERC program. In some cases, the Research Office has computer processed - but not analyzed - data for consortium members. Reports arising out of PERC are transmitted to consortium members in the hope that the information will prove useful for policy-making purposes. All of these activities have been mutually beneficial.

However, a number of specific problems pertinent to the development of adequate scales of measurement arise out of the consortium arrangement. The ultimate causes of these problems are that PERC is a young enterprise and is spread out among independent and geographically distant institutions. The youthfulness of PERC means that some of its procedures and tools are still open; therefore, consortium members are free to shape and reshape measures to suit local interests. As a member of a consortium of independent units, the center for PERC at Empire State College can only advise or request; it cannot command conformity to a uniform set of procedures. To ask conformity at this point is deemed unwise since PERC's first aim is to develop new information relevant to local needs. The distance factor enters into the picture by complicating communication between consortium members. It is true that telephone communication and regularly scheduled visits form cooperative bonds between the members of the consortium, but the connections are not so close that we may construe cooperation as collaboration. Collaboration, in this context, refers to prolonged, intensive contacts centering around the designing, and implementing of common research plans and techniques.

The development of adequate measures directly applicable to present and future consortium members is complicated further by inter-institutional variations in (1) the nature of the student body served, (2) the types of academic programs offered, (3) local demands for specific types of information, and (4) the kinds of research facilities (e.g., computer programs) and methodological expertise available.

It is easy to see how a number of discontinuities can emerge in this kind of setting. Specifically, there are strong tendencies for consortium members to modify the basic data instruments unilaterally and to formulate measures which may have only a purely local interest. This complicates making inter-institutional comparisons.

Comparing institutions seems to be least difficult in the domain of the computation of educational costs. While different institutions use different computational formulas, the elements that go into the formulas are common. Therefore, there is no great difficulty - if the basic information is complete - in making cost comparisons. In the middle range of difficulty are such problems as matching-up programs. Is the health sciences area of concentration at College X substantially similar to the Community Services area at College Y? A careful analysis of the programs of education at both places would be required to answer this question. The highest level of difficulty occurs when questionnaire items are radically and unilaterally changed around. In that case, the possibilities for inter-institutional comparison are slight.

The most frequent source of difficulty encountered in attempting to formulate reliable scales with cross-institutional potentialities is apparent when differences exist in student bodies. For example, a university such as Green Bay tends to draw younger, single people from rural areas whereas Empire State attracts older, married persons from urban areas. The Student Biographical Inventory was applied uniformly to both populations of students. However, the sociological differences between the two student populations produces different patterns of inter-correlation between various attitudes and behaviors. Where these inter-correlations are basic data for the formulation of research instruments, direct, scale-by-scale comparisons are not feasible.

The problem of the external validity of a measuring instrument - its applicability to specific samples of persons - can only be determined through extensive experience with the instrument. The instruments discussed

in this section have been derived from cohorts of FSC students and it will be necessary to try these scales at other places before a judgment about external validity can be made. Some preliminary evidence from the PERC program at the University of Wisconsin at Green Bay suggests that some dimensions of behavior observed at ESC may not apply to Green Bay students. Therefore, no claim for the universal applicability of the instruments discussed below is made.

Finally, while PERC requires instruments with satisfactory levels of reliability and validity, we recommend that the verification of significant substantive propositions be established by "triangulation". In the multiple perspectives philosophy - a basic premise of PERC - triangulation refers to the use of several different kinds of data or methods of analysis; verification obtains if the different kinds of data or methods of analysis tend toward the same conclusion (Campbell & Fiske, 1959). All of these matters should be kept in mind by persons interested in using the scales described below for the purpose of making inter-institutional comparisons.

RELIABILITY, VALIDITY AND DIMENSIONALITY OF SELECTED SBI AND SEQ ITEMS

In keeping with PERC's longitudinal requirements, four questionnaires were designed to be applied to ESC students; (1) the Student Biographical Inventory (SBI), (2) the Student Experience Questionnaire (SEQ), (3) the Program Completion Questionnaire (PCQ), and (4) the Graduate Follow-up Questionnaire (GFQ). These questionnaires are administered at various points in the student's career and form the basic data for PERC, at least as it is constituted now. The first questionnaire, the SBI, provides data for describing a student's "initial" state; the second questionnaire, the SEQ, provides "thruput" data; the third questionnaire, the PCQ, provides a first reading for the "output" state; and the fourth questionnaire, the GFQ, provides a second reading for the output state.

The battery of instruments described above serve different functions and, in general, consist of items unique to each questionnaire. However, in some instances questionnaire items are replicated across forms in order to provide information which would be useful in a study of patterns of student change. This section of the report primarily describes initial attempts to understand SBI items which have been replicated in later forms. These items will be used later in conjunction with the PCQ to determine how much change in student attitudes and behavior occurs. Lesser attention is given to the analysis of data taken from the SFQ.

At this point some preliminary remarks to help orient the reader are in order. Ordinarily a distinction is drawn between substantive information which describes a phenomenon and methodological information that describes a research instrument that may be used to describe or measure some aspect of a phenomenon. This distinction mirrors the traditional philosophical distinction between ontology and epistemology. In practice, research into instruments tells us things about aspects of the phenomena that the instruments are directed toward, and knowledge of the phenomenon provides useful information for the design of research instruments. For example, suppose that a set of items are designed to measure one trait, degree of participation in local community activities. Suppose further that analysis shows that these activities are inter-correlated in a peculiar way so that three "sub-sets" of activities are revealed: participation in "cultural" activities, "citizenship" activities, and "human walfare" activities. Two interrelated pieces of information are now available to the researcher: he knows that he has failed to construct a scale that measures one trait and that people participate in different kinds of community activities. In other words, the analysis provides methodological and substantive information. This kind of interrelationship is revealed in the analysis described on the following page.

ANALYSIS OF SBI QUESTION 40: LEISURE TIME VALUES

Question 40 of the SBI lists thirty-five leisure time activities. Respondents are asked to check the frequency with which they engaged in each of these activities. The response modes were "never," "rarely," "sometimes," and "often." Figure 6 displays the 35 sub-items that make up Question 40.

Figure 6

Question #40, Student Biographical Inventory.

40. Below is a general list of things that people sometimes do. In past year, how many times have you in your leisure:

	Never 0	Rarely 1 - 3	Sometimes 4 - 9	Often +10
a. read some poetry				
b. read a practical book or journal (e.g., Ladies Home Journal, Popular Mechanics)				
c. read articles in intellectually-oriented magazines or professional journals (e.g., The Atlantic Monthly, Commonweal, Science, Harpers)				
d. read the editorial column of a newspaper				
e. read a mystery, spy novel, or similar kind of "escape" book				
f. read accounts of contemporary events in a magazine (e.g., Newsweek, Time, U.S. News & World Report)				
g. read a book on social science (e.g., history, psychology, sociology, geography, economics, political science, education)				
h. read a books in arts and humanities (e.g., music, art, dance, literature, philosophy, religion, a foreign language)				
i. discussed the merits of political/economic system (e.g., communism, socialism, capitalism, etc.)				
j. discussed world or national problems				
k. discussed social issues with friends (e.g., civil rights)				
l. discussed a scientific theory or event (e.g., open heart surgery)				
m. discussed art or music				
n. discussed philosophy or religion				
o. discussed plays, novels or poetry				
p. discussed a movie				
q. discussed a sports event				
r. discussed recipes, home decorating, etc.				

	Never 0	Rarely 1 - 3	Sometimes 4 - 9	Often +10
s. attended a scientic lecture				
t. visited a scientific exhibit				
u. took tours of factories, businesses, etc.				
v. observed governmental agencies (e.g., FBI, US Mint)				
w. attended a stage play				
x. attended a movie				
y. attended a lecture on a current social, economic or political problem				
z. attended a music recital or concert				
aa. attended a sports event				
bb. visited an art exhibit				
cc. visited a library				
dd. tried some sketching, drawing, painting, sculpture, etc.				
ee. watched TV news specials (e.g., Watergate) or documentaries (e.g., Inside the Bamboo Curtain: Red China Today)				
ff. explained or illustrated a scientific principle to someone				
gg. watched a sports even on TV				
hh. attempted to invent something or to solve a mathematical puzzle				
ii. attempted to fix a complicated piece of machinery (e.g, auto, sewing machine, TV)				

A preliminary content analysis of these items indicates that three very concrete concepts might provide an organizing framework for most of the items making up Question 40: reading, discussion with others, and attending social events. (Under this conception, it was not possible to fit the last six questionnaire items and these were dropped from some of the analyses.) These leisure time activity items cover a broad range of activities. For example, under reading activity, poetry, practical journals, mysteries, editorials and other kinds of materials are referred to. Discussion activities ranged all the way from something esoteric such as discussion of a scientific theory to a popular pastime such as discussion of a movie. Similarly, social events covered the gamut from attending a scientific lecture to attending a sports event.

One reason for focusing on these three concepts is that they appeared to be interpretable in terms of more abstract concepts. Reading behavior may be viewed as an index to engagement with the symbolic milieu, the culture, of a society. Discussion behavior may be viewed as a potential index to social articulateness, the ability to express one's views in a public setting. Attendance at social functions may be viewed as indexing sociability, the degree to which the individual participates in events which involve many other persons. These higher-order concepts may be related to a student's ability to succeed in ESC's innovative educational program and to apply ESC learnings to one's life, expecially one's job.

To determine the utility of the three master concepts, the twenty-nine items which were used were split into three sets: 40a-40h, 40i-40r

and 40s-40cc. Experimenting a bit with the response "cutting points", it was possible to achieve K-R (formula 20) consistency reliabilities of .65, .73 and .69 for symbolic engagement, articulateness and social participation behavior, respectively. These are better than average reliabilities and suggest that the content of each of the three sub-sets is reasonably homogenous. Therefore, numericization of these three scales is feasable under this analysis.

The Spearman-Brown split-half (S-B) reliabilities for these three sub-sets of items are .68, .80 and .79. These values may be taken as an index to test-retest correlations. These are better than average S-B coefficients.

The foregoing analysis operated from an apriori partition of 29 items. What would happen if we attempted to group all the items in a purely empirical manner? Empirical exploration of the dimensions in Question 40 was undertaken by means of factor analysis. Independent dimensions were sought; therefore, "orthogonal" rotation (under the Varimax criterion) was invoked.

The entries in Figure 7 are known as "factor loadings". These loadings reflect the degree of correlation between a variable and the factor. As a strategy for interpretating of the factors, a minimal factor loading value of .50 was selected. Those loadings meeting this criterion are shown with a check mark (√).

Figure 7

Varimax Rotated Factor
Matrix for SBI Question #40

Item	Factor 1	Factor 2	Factor 3	Factor 4
a	✓0.56524	0.02708	0.13529	-0.20266
b	-0.00049	0.21873	0.14592	-0.09947
c	0.15957	0.32018	0.32151	-0.15490
d	-0.02038	0.09959	0.47182	0.10751
e	0.13742	-0.05716	0.12419	0 14955
f	0.05991	0.13159	0.44529	0.12452
g	0.28067	0.15427	0.25943	-0.20479
h	✓0.63403	0.02635	0.11842	-0.24266
i	0.16489	0.07852	✓0.65116	-0.01705
j	0.04254	0.01672	✓0.76202	0.09471
k	0.18244	0.04220	✓0.66970	0.03316
l	0.17345	0.40151	0.31770	-0.10163
m	✓0.70969	-0.01408	0.08707	-0.04134
n	0.47696	0.01335	0.27740	-0.18647
o	✓0.73477	-0.09181	0.21759	-0.01339
p	0.48939	-0.13825	0.12111	0.35002
q	-0.14785	0.14397	0.16676	✓0.77032
r	0.28590	0.05155	0.04982	0.07878
s	0.17164	✓0.65920	0.06333	-0.11781
t	0.25152	✓0.65832	0.05654	0.01841
u	-0.01093	0.46169	0.06357	0.26799
v	0.03342	0.34167	0.18942	0.17961
w	✓0.57675	0.08062	0.05557	0.08242
x	0.43456	-0.13840	0.06594	0.35043
y	0.29414	0.30656	0.28059	-0.02518
z	✓0.63041	0.07862	-0.04108	0.00650
aa	-0.02932	0.20349	0.02633	✓0.68683
bb	✓0.66133	0.16666	0.01848	-0.05064
cc	0.35416	0.13958	0.15087	-0.15031
dd	0.43366	0.19065	-0.08274	-0.04924
ee	0.07522	0.16803	0.36650	0.21381
ff	0.01881	✓0.64792	0.10703	-0.02280
gg	-0.21055	0.15035	0.16060	✓0.74045
hh	0.03493	0.45785	0.03759	0.12507
ii	-0.15296	0.43252	0.00265	0.18614

The six major variables loading on Factor 1 have a common subject: artistic matters. The three major loadings on Factor 2 deal with scientific matters. The three major loadings on Factor 3 seem to center on national and international social issues. The three major loadings on Factor 4 center on an interest in popular culture, specifically sports.* These factors do not reflect the three concepts that were previously mentioned: engagement with symbolic milieu, social articulateness and sociability.

There is no inconsistency between the factor analysis and the diagnosis of the items under the Kuder-Richardson formula. The mathematical models underpinning these techniques are different and the outcomes may be different. Second, the K-R coefficients were computed on three deliberately selected sub-sets of items whereas the factor analysis operated freely over the entire set of thirty-five items.

Two major conclusions flow from the analyses described above. One, the items that make up Question 40 can be deployed to form scales to index engagement with the symbolic milieu, articulateness and social participation. Second, if the items making up Question 40 are interpreted as revealing student concerns or interests, it appears that the interests of incoming students fall along four major axes having to do with art, science, political/social issues and sports.

Ultimately, we will want to see how students change on these scales and dimensions during the course of their college careers, but up to this point nothing has been said about the <u>validity</u> of the items that make up Questions 40. For example, do those students who say that they

---

* Five additional factors were extracted. All nine factors were interpretable but it would not pay to burden the text with a discussion of the five factors of lesser importance.

frequently read poetry actually do so, or are they merely constructing images to satisfy the researcher-as-audience? Here we are raising questions about the accuracy or validity of the basic data.

One way of addressing the validity of questionnaire items is to formulate and test predictions involving these items. For example, if a respondent claims that he greatly enjoys reading, it should be possible to predict accurately whether he owns a library card - if the claim is valid.

Under this logic for establishing item validity, twelve items from Question 40 were selected for testing. From these twelve items, twenty-seven inferences were drawn which involved ten criterion items. A matrix representing the structure of the investigation is shown on Figure 8.

The Chart should be interpreted in the following way: every cell containing a chi-square correlation reflects the existence of a reasonable hypothesis which connects a row (test) variable with a column (criterion) variable. Conversely, blank cells reflect the absence of reasonable inferences from row behaviors to column behaviors. For example, take the first test variable, reading poetry. The inference was made that a person who frequently reads poetry would be likely to discuss plays and poetry and to attend stage plays. The chi-square correlations between poetry-reading and the two criterion variables are 227 and 42, respectively. Both of these correlations greatly exceed the minimum chi-square value required for statistical significance at the .001 level, 6.64. Therefore, we may say with certainty that the poetry-reading item enables us to predict discussing plays and poetry and to predict attendance at stage plays. And, under the concept of predictive or concurrent validity, we have the "right" to conclude that item 40a, the poetry-reading item, elicits valid data.

Figure 8

Chi-Square Correlations Between Selected Items from SBI, Question 40

Criterion Variables

Test Variables

	Discuss world/national problems	Discuss social issues	Discuss art/music	Discuss plays/poetry	Attend plays	Attend movies	Attend lectures	Attend recitals	Attend sports	Visit art exhibits
Read Poetry				227	42					
Read intellectual magazines	24	46					43			
Read news magazines	56						14			
Read arts/humanities books			208	221	87			164		194
Discuss world/national problems		238					20			
Discuss social issues							24			
Discuss art/music				317	78			234		201
Discuss plays					151			128		158
Discuss movies						464				
Discuss recipes									409	
Attend plays								227		217
Attend recitals										225

The reader will note that this inquiry into the validity of the items which make up Question 40 was a partial one. There are practical limitations to establishing the validity of questionnaire items by the method of prediction. Sometimes it is not possible to formulate reasonable predictive inferences; sometimes reasonable inferences can be made but the data available does not allow testing the inferences. In this case, only about a third of the items were investigated through the empirical examination of twenty-seven predictions. Still, it is important to note that in every single instance the chi-square value greatly exceeded the minimum value required to attain statistical significance.

SBI QUESTION 41: STUDENT SELF-RATINGS

Question 41 asks in-coming ESC students to rate themselves over twenty-six personal traits. These traits, shown in Figure 9, range from specific abilities (e.g., ability to write) to more general personality variables (e.g., cheerfulness). The respondent is asked to compare himself "with the average person of your own age."

Figure 9

Question #41, Student Biographical Inventory

41. Rate yourself on each of the following traits when compared with the average person of your own age. We are interested in estimates of how you see yourself.

Trait	Lowest 10%	Below Average	Average	Above Average	Highest 10%
a. Ability to handle stress					
b. Academic ability					
c. Athletic ability					
d. Artistic ability					
e. Cheerfulness					
f. Drive to achieve					
g. Idealism					
h. Impulsiveness					
i. Independence					
j. Leadership ability					
k. Mathematical ability					
l. Mechanical ability					
m. Optimism					
n. Originality					
o. Personal Organization					
p. Persistence					
q. Popularity					
r. Public speaking ability					
s. Reading ability					
t. Resourcefulness					
u. Self-confidence (intellectual)					
v. Self-confidence (social)					
w. Sensitivity to criticism					
x. Stubbornness					
y. Tolerance					
z. Writing ability					

Some of these items have special relevance for success in ESC's educational program. Since ESC is devoted to education under the learning contract mode of instruction, students are required to play a very active part in their own education. In addition to academic ability which is required at any college, FSC's program requires students who are able to work independently, have strong success motives, can handle the stress of combining educational and occupational roles, and who have the personal resources to meet new challenges. These are not traits that are ordinarily required of young people functioning in traditional, lecture-centered, college programs.

The items that make up Question 41 have some special properties which make it difficult to form apriori hypotheses about the possible existence of assemblies of traits. This means that a purely empirical method must be used - factor analysis in this case - to identify trait syndromes. Second, for this question the inferential logic for applying a validity criterion through the formation of predictive inferences from one item to another is weak. Therefore, no attempt was made to check the predictive validity of Question 41. (Since these same arguments apply to SBI Questions 42, 44 and 45, the same conclusion applies to those questions as well.)

Items 41a-41z were factored and orthogonally rotated under the Varimax criterion. Eight factors were extracted. The first four factors accounting for 79% of the common variance are shown in Figure 10.

Figure 10

Varimax Rotated Factor
Matrix for SBI Question #41

Figure 10 has been deleted due to
irreproducibility

Again, to facilitate interpretation of the factors, special attention was given to loadings equal to or greater than .50. These loadings are highlighted by check marks (✓). Items 40b, 40s, 40u and 40z loaded on Factor 1. The content of the items which make up this factor suggest the dimension of intellectual capability. The .42 loading of 40t, resourcefulness, tends to confirm this interpretation. Items 40q and 40v loaded in Factor 2. The content of these items suggests a dimension of social self-confidence. The .46 loading of 40j, leadership ability, and the .42 loading of public speaking ability strongly tend to confirm this interpretation. Factor 3 loaded items 40k and 401. The content of these items suggests the dimension of problem-solving ability. Factor 4 loaded four variables, items 40f, 40j, 40o and 40p. The content of these items imply an achievement motivation dimension. This interpretation is consistent with the .47 loading of item 40i, independence, on this factor.

The remaining four factors accounted for about 20% of the common variance. Factor 4, items 40d and 40n, was interpreted as an artistic ability dimension. For Factor 6, only item 40y met the .50 criterion. Bending this criterion a bit to include 40e and 40m, we inferred that Factor 6 represented the dimension of interpersonal trust. Factor 7 loaded one item, 40x, stubborness. Factor 8 loaded item 40h, impulsiveness.

Ex-post-facto, the first four factors seem to make sense. Most of Empire State's students are middle-age adults with families. They tend to be strongly motivated to the attainment of the goal of success and frequently have good occupational records. These are exactly the sorts of people who would rate themselves along the four major dimensions revealed by the factor analysis. Therefore, we believe that these factors

accurately characterize ESC students and that the formulation of numericized self-evaluation scales for intellectual capability, social self-confidence, problem-solving ability and achievement motivation are feasible.

ANALYSIS OF SBI QUESTION 42: GOALS IN ATTENDING EMPIRE STATE COLLEGE

Question 42 of the SBI consists of fifteen personal goals which students may have in attending Empire State College. Students were asked to rate the importance of achieving each of these goals. The question is shown in Figure 11.

Figure 11

Question #42, Student Biographical Inventory

42. At Empire State College how important is it that you achieve the following general objectives? (Mark one answer for each reason) Also circle the letter of the item that is MOST important to you.

	Not Important	Somewhat Important	Very Important
a. To increase my appreciation of art, music, literature, and other cultural expressions			
b. To discover my vocational interests			
c. To attain specific skills that will be useful on a job			
d. To develop a new career			
e. To meet the academic requirements necessary to enter a profession or graduate school			
f. To become involved in social and political concerns			
g. To increase my awareness of different philosophies, cultures and ways of life			
h. To improve my chances of making more money			
i. A degree is required for my present or future job			
j. To learn how to participate effectively as a citizen in my community			
k. To develop an understanding and an appreciation of science and technology			
l. To improve my self image			
m. Simply, to learn			
n. To improve my professional status			
o. To increase my desire and ability to undertake self-directed learning			
p. Other (please specify)			

Inspection of the fifteen goals suggests some apriori dimensions of goal-attainment. Some of the goals listed center on the pleasure of learning. These are items 42a, 42g and 42m. Items 42e and 42i center on career-requirement for a baccalaureate degree - on the job or for admission to graduate school. Items 42f and 42j suggest an interest in the goal of political participation or effective citizenship. Items 42h and 42n imply an interest in the goal of improving one's social status. And items 42b and 42c seem to focus on the goal of vocational change.

A matrix of tetrachoric correlations was factored and five factors exhausted the common variance. The factor loadings are shown in Figure 12.

Figure 12

Varimax Rotated Factor Matrix for SBI Question #42

Figure 12 has been deleted due to
irreproducibility

But in some ways the output was not altogether satisfactory. For example, we expected item 42k, appreciation of science and technology, to load most heavily on Factor 1, desire for learning, not Factor 4. Second, the loading of variable 42j, community participation, on Factor 4, desire for improved social status, was unexpectedly large. Still, our major expectations were met and we now have reason to believe that several factors can be used to form scales to locate students along some dimensions of personal goals.

ANALYSIS OF SBI QUESTIONS 44 AND 45: SELF-RATINGS FOR INTELLECTUAL COMPETENCE AND PERSONAL DEVELOPMENT

Under Questions 44 and 45 of the SBI incoming students are asked to evaluate themselves in the areas of intellectual competence and personal development. The baseline for self-judgment is "others your age" (See Figure 13).

Figure 13

Questions 44 & 45, Student Biographical Inventory

44. Listed below are areas of intellectual competence of particular concern to some students. Indicate where you think you are now in relation to other people your age. For more complete descriptions of these areas, see the section on College Objectives in your Empire State Catalogue. We realize that this is a difficult item, but please give it your best shot.

AREAS OF INTELLECTUAL COMPETENCE	WHERE YOU ARE NOW IN RELATION TO OTHERS YOUR AGE Lowest 10%//Below Aver.//Aver.//Above Aver//Top 10%
a. COMMUNICATION SKILLS: (to write and speak clearly, correctly and effectively)	
b. KNOWLEDGE (of information, theories, generalization, methods of inquiry, and criteria for judgments)	
c. COMPREHENSION of knowledge (thus allowing personal interpretations)	
d. Ability to ANALYZE (to break down an experience into basic elements)	
e. Abilty to EVALUATE (to make qualitative and quantitative judgments about the value of information, materials and methods)	
f. Ability to SYNTHESIZE (to arrange and combine elements so that new patterns appear)	
g. Ability to APPLY (to use theory in practical activities)	

45. Listed below are areas of personal development of particular concern to some students. Please rate where you think you are now in relation to other people your age. For more complete descriptions of these areas, see the section on College Objectives in your Empire State Catalogue. We realize that this is a difficult item, but please try to respond.

AREAS OF PERSONAL DEVELOPMENT	WHERE YOU ARE IN RELATION TO OTHERS YOUR AGE				
	Lowest 10%	Below Aver.	Aver.	Above Aver.	Highest 10%
a. INTERPERSONAL COMPETENCE, the ability to interpret the intentions and attitudes of others and to improvise appropriate responses.					
b. AWARENESS, openness to new ideas and experiences, sensitivity to social conditions and cultures.					
c. CLARIFYING PURPOSES, concerns vocational interests, non-vocational interests, and general life-style considerations.					
d. SELF-RELIANCE, the capacity to act independently					
e. SELF-UNDERSTANDING, the process of self-examination and discovery of personal motives, strengths, and weaknesses.					
f. UNDERSTANDING OF OTHERS, the capacity to move beyond relationships of simple understanding to those where there are sympathetic responses to diverse kinds of persons and their conditions.					
g. SELF-CONSISTENCY, the clarification of attitudes and values so that words and actions are in harmony.					

Questions 44 and 45 were designed to measure two important educational outcomes at Empire State College. The College believes that a student's degree program and contract work should strengthen his intellectual competence and deepen his understanding of self and others. These competencies reflect a conceptual division of behavior into cognitive and affective spheres. The major axioms of this conceptualization are developed in the work of Bloom and Chickering (Bloom, et. al., 1956, 1964; Chickering, 1969).

As a first step toward determining the content-homogeniety of these two questions, K-R formula 20 was exploited. Partitioning responses to get "splits" as close to the 50-50 criterion, an internal consistency reliability coefficient of .88 for intellectual competence was obtained; the K-R value for personal development was somewhat lower, .80. These are fairly good K-R reliabilities, and we now have reason to treat each question as a distinct scale.

As a double check on the inferences of univocality drawn, the K-R coefficients, all twelve items making up Questions 44 and 45 were factor analyzed together. Again, the procedure called for orthogonal rotation under the Varimax criterion. The output is shown in Figure 14.

Using a criterion of .50 to interpret the pattern of factor loadings, Figure 14 shows that two independent factors were extracted. All of the items making up Question 44 loaded on Factor 1; none of them loaded on Factor 2. Similarly, all of the items making up Question 45 loaded on Factor 2; none of them loaded on Factor 1. Only two factors were extracted. This pattern strongly confirms the hypothesis of univocality suggested by the K-R analysis; second, the factor analysis provides clear evidence that there is little overlap in the variables "tapped" by these two questions.

Figure 14

Varimax Rotated Factor Matrix for SBI Questions 44 & 45

Figure 14 has been deleted due to
irreproducibility

CHAPTER SUMMARY

The Student Biographical Inventory (the SBI) is the first element in a set of questionnaires that is administered to Empire State College students. The form contains several questions which are highly relevant in studying the potency of ESC's faculty and program in modifying the conduct and beliefs of different types of students. These questions (40, 41, 42, 44 and 45) have been examined in this chapter under the rubrics of reliability, validity and dimensionality.

In formulating the five SBI questions mentioned above, the authors tried to "tap into" five areas of conduct which might be modified by educational experiences at Empire State College: (1) leisure time values, (2) self-evaluations for selected personality traits, (3) personal goals, (4) self-evaluations for intellectual competency, and (5) self-evaluations for personal development. This chapter described the first systemmatic attempts to determine the utility of the questions in indexing these five areas of special concern.

Looking back over the preceding pages it is now possible to summarize a number of conclusions. For the sake of simplicity, these conclusions are presented below in list form.

1. Question 40 (thirty-five items dealing with uses of leisure time) has face validity. It was not possible to subject all thirty-five sub-parts of Question 40 to tests for validity, but sixteen of the thirty-five items were assessed for predictive validity through entailment in twenty-seven hypotheses. In each case, the hypothesis was supported by substantial chi-square correlations. Therefore, we have some sound basis for asserting that the predictive validity of the sub-parts that make up Question 40 seems quite good.
2. A partition of Question 40 into three major divisions of leisure time use (reading, discussing and going out) behavior produced medium-range Kuder-Richardson coefficients: .65, .73 and .69. Many psychological tests currently in use have K-R coefficients in this range.
3. The Spearman-Brown split-half reliabilities for these three partitions of Question 40 were .68, .80 and .79. These are better than average S-B reliabilities.
4. A factor analysis of Question 40 shows that the items can also be grouped to form four scales: artistic orientation, interest in scientific developments, concern with social issues and interest in popular culture.
5. Question 41 (twenty-six items dealing with self-ratings over selected personality traits) possesses face validity; however, it was not possible to subject these items to other validity checks.
6. A factor analysis of Question 41 indicates that FSC students tend to rate themselves along eight dimensions. The four most important dimensions are intellectual ability, social self-confidence, problem

solving ability, and motivation to achievement. The remaining four factors had to do with artistic ability, interpersonal trust, stubbornness and impulsiveness. While the number of items loading on each factor was not very large, the results are interpretable without great difficulty. Therefore, analysis of Question 41 provides substantial information about the self-conceptions of ESC students and provides an empirical basis for comparing those students with students elsewhere.

7. Question 42 (fifteen items dealing with personal goals) was shown by factor analysis to have five dimensions: (1) desire for additional learning, (2) to obtain a degree in order to advance one's occupational or educational career, (3) to learn in order to participate in community affairs more effectively, (4) to improve one's occupational status, and (5) to learn in order to change one's occupational career.

   The number of factors required to group the fifteen items and certain complexities associated with the fourth factor suggest that Question 42 be carefully examined when it comes time to revise the SBI. But there is a kernel of good items here that form some thematically coherent factors which will be useful in locating students along several dimensions of goal-orientation.

8. Question 44 (seven items dealing with self-evaluation for intellectual competence) was analyzed under the Kuder-Richardson formula for internal consistency reliability. The K-R coefficient was .88. This is a respectable value and tends to confirm the hypothesis of unidimensionality.

9. Question 45 (seven items dealing with self-evaluations for personal development) was analyzed under the K-R formula. The K-R coefficient was .80. This is a fairly good value for internal consistency reliability.
10. As a final check on the hypothesis of unidimensionality for Questions 44 and 45, the fourteen items were factor analyzed (orthogonal rotation under the Varimax criterion). Only two factors were extracted by the computer program. All of the self-ratings for intellectual competence loaded on the first factor; all of the self-ratings for personal development loaded on the second factor. No variable loaded on both factors. This provides strong confirmation for the hypothesis of unidimensionality for Questions 44 and 45.
11. Analysis indicates that in future revisions of the form additional attention should be given to the empirical identification of student goals, Question 42.

CHAPTER 4

STUDENT AND PROGRAM TYPOLOGIES

FORMULATING A TYPOLOGY OF INCOMING ESC STUDENTS

The use of typologies in social science has a long history. Max Weber's exotic typology of authority is famous among sociologists. Many mundane and much more practical typologies have been developed by the Census Bureau and used in censuses of population and housing.

A typology partitions a set of objects along two or more dimensions. The minimal logical requirement for any typology is that the categories do not overlap; overlap, of course, would prevent the unequivocal classification of the objects. The minimal empirical justification of any typology is that it displays variation in some variable of special interest to the researcher when that variable is distributed among the categories that make up the typology. For example, consider a typology of height and weight where the two variables are scaled thusly: above average, average and below average. Now suppose that the variable of special interest is proportion ever married. If the nine proportions do not vary we have to conclude that the classification failed as a device for explaining marital status. On the other hand if it was found that the proportion married was markedly higher in the average height-average weight category, we might infer that people who depart substantially from esthetic norms are not marriageable.

In the present context, the attempt to develop a typology of ESC students arose out of a concern with student success and failure in ESC's innovative educational program. Empire State College's learning program relies almost exclusively on the "learning contract" - not the lecture method - mode of instruction. This mode of learning requires that the student accept a substantial part of the responsibility for his own education. He and his mentor design a contract which sets out the

educational goals of the student, specifies how the learning contract facilitates the attainment of these goals, lists the specific learning activities that the student will undertake, and identifies the criteria by which the student's work will be evaluated. A second feature of ESC's program that is unusual is that the College grants degree credits for prior life-learnings. For example, a person might be awarded college credit for college-level learning acquired through intensive reading, work, travel, military training or community activity. The major task for the student here is to demonstrate, usually through a documentation process, that degree-relevant college-level learnings did occur. A third unique feature of ESC is that each degree program is tailored to fit the requirements of individual students. Of course, there are some standard requirements set by the State of New York but within those parameters a great deal of variation is permitted. The main point here is that the student, with the advice of his mentor, has the major obligation for developing his own degree program.

Quite unlike the traditional college, where a student can pass many of his undergraduate courses by sitting passively and listening to lectures, and where programs of study are formalized, the ESC student must overcome a number of substantial hurdles to "get through." The average ESC student is a mature, working adult with a family; he/she has to learn pretty much on his own in settings and under social pressures that can produce real strains on the student. Secondly, ESC's program requires that a student's learning program be directed at the attainment of some definite purpose. The College does not prescribe purposes; however, it does require that the student carefully assess

his life experiences and values and prescribe a reasonable set of goals for himself. There is nothing simple about this biographical stock-taking and for some students clarifying their goals is viewed as a substantial obstacle. Next, the demonstration of prior college-level learning outside of formal institutions of higher learning is a complicated process; the burden of proof is on the student and sometimes months of effort are required for a student to put his "portfolio" of prior learnings together and to get his claims to learning validated by the College's Office of Program Review and Assessment.

These facts suggest that success in Empire State College's program might depend on three individual properties: (1) degree of clarity of individual goals, (2) motivation to success, and (3) cultural resources for self-education in the individual's past history. Putting the matter plainly, the working hypothesis for a typology of students was that students who knew what goals they wanted, had the motivation to attain those goals, and had cultural experiences suitable for functioning in ESC's academic milieu, would succeed. Put somewhat more elegantly, it was hypothesized that a tri-dimensional typology consisting of the three variables mentioned above would be useful in predicting academic success. This too is a job for factor analysis (Winch, 1947).

With these ideas in mind, the SBI was reviewed with the aim of identifying those variables which might serve as indicants of (1) goal clarity, (2) success motivation, and (3) individual cultural resources. Altogether some 63 variables were selected as potential indicants and were subjected to factor analysis under the Varimax criterion.

In a purely exploratory study of this kind there was no expectation that the 63 variables would neatly load on only three factors and that

the content of the variables would exactly match the three apriori concepts. Students everywhere are too diverse in their backgrounds, attitudes and behaviors to fit neatly into such a simple scheme. Rather, the hope was that the three master concepts would be revealed as members of a larger set of factors. In any case, it should be understood that the SBI was not designed originally to fit the three concepts under discussion.

Three factor analyses employing three cohorts of students were made: for students entering ESC in the Fall of 1974 (N = 703), the Spring of 1975 (N = 890), and the Fall of 1975 (N = 1132). The results are shown in Figures 15, 16, and 17. The data might have been aggregated into a single sample but were not in order to determine whether assemblies of variables were stable over the several cohorts.

The outcomes of the three factor analyses are not simple; in the first cohort eighteen factors were extracted by the computer program; in the second and third cohorts, nineteen factors. (In general, seventy-five percent of the common variance was exhausted by the first eight or so factors.) These complexities make it worthwhile to alter the format of presentation here. Instead of presenting the rotated factor structure in detail, the materials are summarized in simpler tables.

It is evident that the data did not "fall out," - perhaps it could not - in a way which would reveal a goal-clarity factor. Rather, the results as shown in Table 1 reveal that the Fall 1974 students directed their conduct toward the attainment of several essentially independent syndromes of goals. The goal entertained in Factor 1 centers around the attainment of knowledge to facilitate more informed citizenship participation. The goal syndrome observed in Factor 5 seems to deal with the

Figure 15

Student Typology:
Factor Analysis of 63 Variables, Fall, 1974
N = 703

Factor and Percent Var.	Content of Variable with Loadings Equal to or Greater than .35	Factor Loading
1 (17)	Goal: Citizenship Participation	.50
	Involvement in social/political concerns	.49
	Awareness different philosophies	.38
2 (10.4)	Leisure: Read social science books	.45
	Read arts-humanities books	.39
	Discuss philosophy and religion	.35
3 (9)	Biography: Father's occupation	.65
	Respondent's occupation	.55
	Mother's Occupation	.41
4 (8.4)	Leisure: Attempts to invent something	.48
	Attempts to fix machinery	.48
	Explained scientific principle	.48
5 (6.2)	Goal: Importance of degree for job	.50
	Improvement of Professional status	.50
	Improve chances to make more money	.41
6 (5.4)	Self-rating: Persistence	.44
	Drive to achieve	.38
	Independence	.37
	Personal organization	.36
7 (4.9)	Biography: Father's education	.75
	Mother's education	.48
8 (4.8)	Goal: Learning to develop new career	.54
	To discover vocational interests	.43
	Biography: Took in-service training courses	-.37
9 (4.2)	Biography: High school academic rank	.56
	How hard studied in high school	-.53
10 (4.1)	Supports: Friends feelings about ESC enrollment	.54
	Family's feelings about ESC enrollment	.52
	Employer's feelings about enrollment	.50
Total (74.5)		

import of a college degree for future occupational advancement. The goal syndrome making up Factor 8 seems to focus on the goal of changing one's current occupation.

This partition of goals was not foreseen and suggests a basic trio of goals: education for community action, education for personal advancement, and education as a means to obtain new experiences.

There is a substantial body of sociological data which goes to show that a student's social class background exerts significant effects on his opportunities to succeed in school. In other words, socioeconomic status may be viewed as possession of a cultural resource. It was expected that the four socio-status variables (respondent's occupation, mother's education, father's occupation and father's education) would load on the same factor. Since this did not occur in this first analysis we have to conclude that there are at least two dimensions to socioeconomic status:occupational (Factor 3) and educational status (Factor 7). If these variables are construed as cultural resources, occupational status may input into quality of prior schooling whereas educational status inputs into the student's milieu as a child - the ability of his parents to appreciate the virtues of college training and to provide those kinds of cultural experiences in the home that facilitate learning in school.

Factor 6, on its face, implies determination to succeed by one's own efforts. The spirit of the factor is that of the "Protestant ethic." The make-up of this factor seems to fit our initial formulation-motivation to success - reasonably well.

To determine the stability of these interpretations, the factor structures for the Spring and Fall 1975 cohorts were examined also.

Figure 16

Student Typology:
Factor Analysis of 63 SBI Variables, Spring, 1975
N = 890

Factor and % Variance	Content of Variables with Loadings Equal or Greater than .35	Factor Loading
1 (22.6)	Self-rating: drive to achieve	.67
	Self-rating: persistence	.62
	Self-rating: leadership ability	.54
	Self-rating: independence	.52
	Self-rating: personal organization	.51
2 (13.4)	Goal: increased self-directed learning	.57
	Goal: improving self-image	.53
	Goal: simply learning	.52
	Goal: awareness different philosophies	.47
	Goal: citizenship participation	.44
	Goal: increasing appreciation of art	.43
3 (10.9)	Goal: improving professional status	.73
	Goal: getting degree for job	.64
	Goal: make more money	.60
	Goal: meet requirements for graduate school	.39
	Goal: attaining specific skills	.37
4 (6.3)	Leisure: read books in arts/humanities	.64
	Leisure: discuss philosophy/religion	.49
	Leisure: read poetry	.49
	Leisure: read books/social science	.47
5 (5.9)	Leisure: attempt to invent something	.66
	Leisure: attempt to fix machinery	.60
	Leisure: explain scientific principle	.55
	Goal: improving understanding of science	.43
6 (5.6)	Leisure: read intellectual magazines	.49
	Leisure: read practical journals	.48
	Leisure: read newsmagazines	.38
7 (4.5)	Biography: father's education	.84
	Biography: father's occupation	.68
	Biography: mother's education	.47
8 (4.3)	Supports: friend's feelings about enrollment	.69
	Supports: family's feelings about enrollment	.50
	Supports: employer's feelings about enrollment	.48
TOTAL: (73.6)		

Figure 17

Student Typology:
Factor Analysis of 63 SBI Variables, Fall, 1975
N = 1132

Factor and % Variance	Content of Variables with Loadings Equal or Greater than .35	Factor Loading
1 (21.8)	Self-rating: persistence	.68
	Self-rating: drive to achieve	.62
	Self-rating: independence	.56
	Self-rating: personal organization	.56
	Self-rating: leadership ability	.55
	Self-rating: ability to handle stress	.50
	Self-rating: resourcefulness	.46
	Self-rating: social self-confidence	.42
	Self-rating: intellectual self-confidence	.40
2 (13.1)	Goal: increase self-directed learning	.58
	Goal: citizenship participation	.54
	Goal: awareness different philosophies	.54
	Goal: improving self-image	.51
	Goal: improving understanding of science	.45
	Goal: increasing appreciation of art	.43
	Goal: simply learning	.42
	Goal: involvement in social/political concerns	.40
3 (12.2)	Goal: improving professional status	.73
	Goal: getting degree for job	.63
	Goal: make more money	.61
	Goal: meeting requirements for graduate school	.38
4 (7.3)	Leisure: read books in arts/humanities	.60
	Leisure: read newsmagazines	.60
	Leisure: read poetry	.42
	Leisure: read intellectual magazines	.38
5 (6.3)	Leisure: attempt to invent something	.63
	Leisure: explain scientific principle	.62
	Leisure: attempt to fix machinery	.53
	Goal: improving understanding of science	.45
6 (5.5)	Self-rating: artistic ability	.79
	Leisure: draw or sketch	.64
	Self-rating: originality	.51
	Leisure: read books in arts/humanities	.36
7 (4.5)	Biography: father's education	.86
	Biography: mother's education	.50
8 (4.1)	Support: friends' feelings about enrollment	.59
	Support: employer's feelings about enrollment	.56
	Support: family's feelings about enrollment	.48
Total (74.9)		

These are shown in Figure 16 and Figure 17. In both instances nineteen factors were extracted. (Eight factors accounted for about 75% of the variance.)

There are no definite rules to guide the comparison of factor structures. Factor structures may be compared in a number of ways: the number of factors extracted, the number and identity of the variables making up each factor, the factor loadings, and so on. Therefore, judgments about similarities and differences between factor structures have to be viewed as qualitative enterprises.

A comparison of the Fall 1974, Spring 1975 and Fall 1975 cohorts shows a substantial degree of similarity. There are differences too. Figure 18 summarizes these relationships.

Figure 18

SBI Factor Similarities, by Cohort and Factor Number

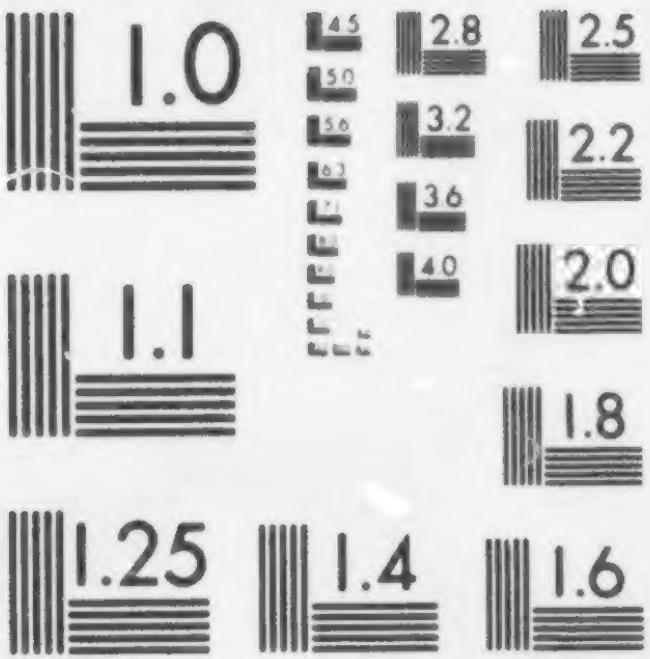
Fall 1974	Spring 1975	Fall 1975
1	2	2
2	4	4
3	7	7
4	5	5
5	3	3
6	1	1
7	7	7
8	-	-
9	-	-
10	8	8

Figure 18 shows that Factor 1 in the Fall 1974 cohort of students is similar (not necessarily identical) to Factor 2 in the Spring 1975 and Fall 1975 cohorts. The Figure also shows that Factor 8 and Factor 9 in the Fall 1974 cohort have no analogies in the other two cohorts.

Figure 18 highlights some of the anomalies in the Fall 1974 factor structure. Desire for a new career (Factor 8) and the complex partition of social background variables (Factors 3, 7 and 9) are revealed as idiosyncratic to that cohort. It would appear that the greatest degree of similarity is between the two 1975 cohorts.

In general, the data for the two 1975 cohorts tend to fit the initial interpretation that was made. Student goals seems to be divisible into two sorts: (1) goals having to do with the larger ends of liberal education, and (2) goals having to do with the advancement of one's occupational or educational career. This division of goals is revealed in the make-up of Factor 2 and Factor 3. Factor 1 in the 1975 cohorts mirrors Factor 6 in the 1974 cohort, determination to succeed by one's own efforts. Lastly, Factor 7 reflects the student's socioeconomic background. We interpret this factor, as mentioned previously, as access to cultural resources. The last factor in all three of these analyses, support for enrollment at ESC, may be viewed as a social resource.

It is not possible to account in a satisfactory way for every difference in the Factor structures. For example, Figure 16 shows that Factor 1 has five variables with loadings of .35 or more: Figure 17 shows that Factor 1 loads these five variables too but there are four additional variables that meet the .35 criterion. Since the core of the content of both factors is identical - motivation to success - we conclude that the factor is stable across these two cohorts. Similarly, the four variables



MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS-1963-A

that make up Factor 6 in Figure 15 represent this trait. Therefore, the conclusion is that motivation to success is a stable dimension of student behavior. But it is not possible to explain why this dimension is represented by four variables in the 1974 cohort and by five variables in the Spring 1975 cohort. Nor can we explain the arithmetic differences between factor loadings for particular variables. The only thing that can be said is that these cohorts of students are similar; they are not identical.

Summing up this section dealing with the problem of formulating a typology of students based on SBI data, we may say that the data suggest that students may be partitioned along three dimensions: (1) commitment to the goals of personal advancement and self-education; (2) motivation to success, and (3) access to cultural resources.

TYPOLOGY OF LEARNING-RESOURCE USE: ESC's PROGRAM

As previously mentioned, the major question driving PERC is "What kinds of students, in what kinds of programs, interacting with what kinds of faculty, change in what ways, and at what cost?" Up to this point, the discussion has been confined to research dealing with the student. Now we turn to the program. In this context, program refers to the various methods through which learning occurs at Empire State College. These methods are shown in Figure 19. The eighteen methods displayed in the table are construed as learning resources. The immediate task was to formulate a conceptual typology of learning-resource use. This too is a job for factor analysis.

The basic source of data for classifying programs derives from the Student Experience Questionnaire (the SEQ)*. The SEQ is administered to

* See Appendix D for the version of the SEQ used in this analysis

an ESC student after his portfolio of prior learning has been assessed for advanced standing. Normally, at this point, the student is fairly far along in his undergraduate program.

The questionnaire was mailed to students on January 2, 1974 and an April 5, 1974 cut-off date was established. Over that four-month interval 483 usable questionnaires were returned. This number corresponds to 27% of the total student enrollment at that time; it represents a response rate of 69%

Conceptually, the eighteen variables represent ESC's program as a set of "stimulus" variables. They represent a list of learning experiences that students at ESC are exposed to. In the vernacular language, these variables are construed as "inputs" that may explain changes in student behavior and attitudes.

The specific research question was to determine if there were intelligible syndromes of these variables so that we may speak of different patterns of learning-resources use. For example, if items 56 (use of tutors), 58e (use of professionals in the field), and 58f (attending community lectures) were intercorrelated, the pattern could be described under the rubric of "learning through first-hand contact with experts." Another possible outcome was a "book learning" vs. "experiential learning" pattern. This pattern could be represented by two sets of items: 42, 46, 58a, 58b, and 58d vs. 54, 58e, 58g, 58h, 58j, 58k, and 58l. This pattern also might be conceptualized as "individual learning" vs. "social-context learning". Such concepts would indicate dimensions of ESC's program.

Figure 19

Learning Resources Used by ESC Students in Their Last Contract

SEQ Question Number	Learning Resources
42	Use of ESC Learning Modules
46	Use of SUNY Independent Study courses
51	Use of a log or journal to record learning
52	Group studies, seminars, or workshops
54	Field work or work experiences
56	Use of tutors as part of a learning contract
58a	Use of libraries
58b	Use of books, documents, newspapers, periodicals
58c	Use of radio, TV, movies, slides, films
58d	Courses at other colleges
58e	Use of professionals in field studies, private lessons
58f	Attending lectures in the community
58g	Interviews in the community
58h	Working in community organizations
58i	Working in state-level organizations
58j	Working in federal-level organizations
58k	Foreign travel
58l	Field trips

To test for the existence of such patterns of learning-resource use, a matrix of tetrachoric correlations was computed and these were orthogonally factored under the Varimax criterion. (The number of cases behind the analysis is 483.

A total of ten factors was extracted; six factors accounted for 77% of the variance. Analysis of the items making up the first six factors eventuated in a definite rejection of the individual vs. social-context learning-resource pattern that had been hypothesized. As a matter of fact, the table of factor loadings was baffling and made no conceptual sense at all. Therefore, there is no purpose in producing that table here.

This initial failure to identify distinctive patterns of learning-resource use among ESC students was disappointing. Originally, it had been supposed that it would be possible to classify students by type of learning-resource use and then to correlate resource type with such variables as quality of academic performance, ability to meet scheduled contract completion dates, success in graduate school, and so on. Therefore, another investigation was launched with the hope that some progress could be made in formulating a typology of learning-resource use. First, the number of program variables under analysis was reduced from eighteen to thirteen variables and a second factor analysis was undertaken. The outcome - again - was not comprehensible. Second, a number of attempts to formulate Guttman scales with these items was made. The five scales that were tried out varied from five to eight items. The highest coefficient of reproducibility was .81; this value falls below acceptable levels set by Guttman. Third, under the hypothesis that the factor analyses had been confounded by variation in student academic "concentration,"

students were divided into three separate groups (social service, business economics, and education) and three separate factor analyses for resource-use were performed. Again, the results were theoretically unintelligible.

In a last attempt to formulate patterns of learning-resource use, the SEQ was set aside and data from the Faculty Questionnaire were examined. The Faculty Questionnaire was administered in 1975 to mentors at three colleges with innovative programs: Empire State, Bunker Hill, and Webster College. Of the 116 usable forms which were returned, nine came from Bunker Hill, thirty-four were from Webster, and seventy-three came from Empire State. The forms must be construed as an accidental rather than systematic sample. Since there is no intention here to generalize from sample to population, "unrepresentativeness" is not a major problem.

The basic data used to identify patterns of learning-resources used was Question 9 of the Questionnaire (the question is shown in Figure 20). Mentors are asked to report frequency of use for the eight learning resources that are mentioned.

Figure 20

Mentor Questionnaire: Learning Resources Used
(N = 116)

9. Please estimate the number of times in the PAST MONTH you have used the following kinds of learning resources in working with students?

	None	1-3	4-10	11 or more
a) learning modules (organized learning packages)				
b) other faculty in the program with knowledge of the subject area				
c) outside persons (as tutors/adjuncts) from other programs or institutions				
d) courses in other programs or institutions				
e) correspondence courses (e.g., SUNY Independent Study)				
f) special short-term residencies (e.g., Women Studies weekend residency)				
g) on-the-job experience				
h) field experience, internships				
i) other learning resources made available through special arrangements (e.g., museums, galleries, etc.)				

Three related hypotheses indicative of specialized modes of resource-use were formulated: (1) use of "traditional" learning resources should be highly correlated, (2) use of "innovative" learning resources should be highly correlated, and (3) the correlations between use of traditional and innovative learning resources should be zero or negative. With these notions in hand, 9b, 9c, 9d, and 9e were designated as traditional learning resources; 9a, 9f, 9g, and 9h were designated as innovative resources.

Kendall Tau correlations were computed. These 28 correlations are shown in Figure 21. They index the degree of correlation between the use of various learning resources.

The six entries in the upper-left triangle of Figure 21 describe the associations within the category of traditional learning resources; the six entries in the lower right triangle describe the associations within the category of innovative learning resources. The twelve entries in the upper right square describe the inter-category associations. Now, if the hypothesis of traditional/innovative patterns of learning-resource use has any merit, the intra-category correlations should be substantially higher than the inter-category correlations. This is not the case. The median for the (six) correlations of traditional resources is .32; the median for the (six) correlations of innovative resources is .23; the median for the (twelve) inter-category correlations is .27. Since this last median falls between the other two, we have to say that these data do not support the hypothesis that programs - on the basis of the learning resources used - can be sorted into "traditional" and "innovative."

Figure 21

Kendall Tau Correlations Between Eight Learning Resources

		Traditional				Innovative			
		9b	9c	9d	9e	9a	9f	9g	9h
Traditional	9b		.31	.34	.17	.15	.22	.23	.34
	9c			.37	.11	.30	.27	.24	.34
	9d				.33	.26	.48	.19	.35
	9e					.20	.30	.28	.26
Innovative	9a						.11	.19	.20
	9f							.32	.26
	9g								.51
	9h								

In a final attempt to achieve a typology of ESC's program, items 9a-9h of the Faculty Questionnaire were subjected to factor analysis and rotation under the Varimax criterion. In this instance, the underlying correlation coefficients are Pearson r's not Kendall Tau's. These correlations were always positive and, in general, remarkably high. As one might suppose in this case, the solution was unifactorial (see Figure 22).

Figure 22

Factor Matrix Using Principal Factor With Iterations

Item	Factor 1
9a	-0.80049
9b	-0.78851
9c	-0.72987
9d	-0.79608
9e	-0.82377
9f	-0.83728
9g	-0.63215
9h	-0.75143

These results were surprising since the operant hypothesis was that items 9b, 9c, 9d and 9 e would load on one factor and the remaining four items would load on a second factor. This two-factor solution - if it obtained - would mirror traditional and innovative patterns of resource use. Therefore, at first sight, a unifactorial solution seems inconsistent with the existential proposition that two distinctive patterns of resource use exist at Empire State College.

It is possible to make some sense out of Figure 22 if we try to identify the content of the factor. Given the phrasing of the question, it can only be the frequency with which learning resources are used. Then, if faculty members were arranged along that continuum and attention is focused on those individuals who never or seldom use the resources mentioned, an interesting question arises: what instructional resources do such faculty members use? The answer is themselves. In other words, mentors with low scores - so to speak - on the factor are probably those mentors who rely solely on themselves to educate the student. The normal way that this is done by the lecture method of instruction. Officially, ESC mentors are supposed to put students into touch with learning resources and to supervise a process of self-education; the expectation is that they will not use themselves as the student's major source of information in the style of the lecture method of instruction. In fact, since most of ESC's mentors are themselves products of the lecture method, it sometimes is difficult for mentors to serve purely as supervisors of learning; for some people the tendencies toward direct instruction are just that strong. Therefore, by abandoning attempts to separate various learning resources into two neat packages and by simply dividing faculty members into those who frequently use the learning resources previously referred to and those who do not, it is possible to separate supervisors of self-learning (innovative program mode) from self-as-source teachers (traditional mode).

This treatment of the factor analysis is, of course, an ex-post-facto interpretation. It required a complete turnaround in conceptual orientation to the items dealing with the use of various learning resources.

Second, on purely logical grounds, there is a weakness in identifying the traditional program by using a residual category: the non-use of the eight resources mentioned in the question. Therefore, it is necessary to speak in a very tentative way about the fit between the concept of traditional/innovative program modes on the one hand and the empirical data on the other hand. The interpretation offered here can be strengthened by examining other correlelative materials. Only in that way would it be possible to confirm that the factor under discussion can be used to form a typology of college learning programs around a traditional vs. innovative axis.

SUMMARY

An analysis of 63 SSI variables was undertaken to determine empirical dimensions for a typology (i.e., classification) of ESC students. The data from three cohorts of students were factor analyzed. The results show that students may be classified by type of goal (self-education and personal advancement), degree of motivation to success, and degree of access to cultural resources (i.e., self and family social status). The patterning of student goals was more complex than had been anticipated. The data do not conform to one apriori hypothesis: the existence of a degree-of-goal-clarity factor. The factor structures show a reasonable degree of stability over time.

Attempts to isolate dimensions of ESC's academic program as revealed in the use of eight learning resources were not very successful. Several

statistical analysis using SEQ data, for example, produced conceptually unintelligible results. Trying to close in this problem by shifting to Faculty Questionnaire data produced mixed results. The overall conclusion is that dividing learning resources into distinct sets, traditional and innovative, has little to recommend it in the formulation of a typology of learning programs. The final statistical analysis does suggest that frequency of resource use is more important in typology-construction than kind of resource used. However, this is an arbitrary interpretation of the data. In the end, it is clear that "type of program" is not an altogether distinct concept and that attempts to sharpen it by empirical methods will have to be continued.

GLOSSARY

adjunct faculty member - A person with special skills or knowledge who is retained by the College to work with students on a part-time basis.

assessment of prior learning, advanced standing and portfolio - Process by which the student's previous educational experience, both formal and informal, is judged for academic credit. Goals of the student and educational objectives of the College guide the judgment of the faculty committee. Advanced standing is the award (in months of academic credit) made by the College after evaluation of the portfolio. The portfolio is a document which describes the student's prior learning and shows how such learning fulfills part of the degree program.

Bloom's taxonomy of educational objectives - The College educational objectives are patterned after the taxonomy of educational objectives developed by Bloom and others to help faculty in curriculum development, student learning and outcome evaluation.

CAMPUS-PMS - Comprehensive Analytical Methods for Planning in University and College Systems: Planning and Management Systems in Toronto, Canada has developed an elaborate cost model for educational institutions.

chains of evidence - PERC develops quantitative and qualitative data that can be linked in examination of program effectiveness. Collectively this data forms chains of evidence.

coordinating center - The administrative headquarters of Empire State College containing the Offices of the President, Academic Affairs, Administration, and Research and Evaluation.

data management plan - A predetermined strategy for answering institutionally relevant policy questions with systematically gathered research data.

degree program - Individual program of the student, which includes prior learning and contract learning, with the appropriate mix of concentration and general learning; the governing planning document for the student's work at Empire State College.

degree program and portfolio process - The portfolio process assesses the student's previous educational experience, both formal and informal, and the portfolio is judged for academic credit. Goals of the student and educational objectives of the College guide the judgment of the faculty committee.

digest and evaluation (D & E) - A document prepared by a faculty mentor that summarizes the activities of a learning contract and gives the mentor's evaluation. It is part of the official student transcript at Empire State College.

effectiveness - Goal achievement according to the multiple standards at the individual, program, or institutional level.

experience cost - Based on entire length of stay with College regardless of number of months or years. Computed by following a given student through a program and assigning costs according to type and time of learning activity used.

FTE monthly cost - All costs pertaining to a student's learning activities for one month of full-time study.

learning centers and units - Dispersed locations of Empire State College; centers hold many faculty mentors, units few.

learning contract - A document that describes a set of learning activities in which a student will engage over a given period of time for a given amount of credit. Means of evaluation and criteria also are stated on learning contracts at most institutions. Learning contracts are the building blocks of the degree program at Empire State College.

mentor - Faculty member of the College who works with the student in constructing a degree program; who counsels students in academic matters; who may provide direct instruction; who is responsible for marshalling appropriate resources necessary for the student to carry out the degree program; and who provides overall evaluation of the student's work.

Mini Cost Effectiveness Study (MCES) - A cross-sectional run-through of the PERC framework in 1974-75.

module - Special study guide prepared by and for Empire State College; an instructional resource particularly suited for contract mode of instruction at the College.

multiple audiences - Might include administrators, parents, accreditors, researchers, state officials, students, faculty, etc.

multiple methods - Might include questionnaires, observation, interviews, rating forms, standardized tests, content analysis, etc.

multiple observers - Might include students, faculty, administrators, outsiders, researchers, etc.

multiple perspectives strategy - A comprehensive term that includes multiple observers, methods, standards and audiences.

multiple standards - Might include test norms, course objectives, course averages, prior students, "ideal" student, etc.

NCHEMS - The National Center for Higher Education Management Systems, in Boulder Colorado, has developed an elaborate cost model for colleges and universities and designed procedures and a computer system for analyzing cost data generated by the model.

outcome - An educational result of the interactions of students, faculty, and programs. PERC organizes individual student outcomes into eight classifications: substantive knowledge, communication skills, cognitive, developmental, personal, occupational, public service and unanticipated. Faculty and program outcomes are not yet categorized.

policy question - An inquiry by executive administrators (and others) about basic patterns of structure and operation of educational organizations.

program - An identifiable organizational entity which has (or could have) goals and objectives. It may not have administrators or a budget but there must be a way to assign costs to it.

reliability - A concept generally concerned with the consistency with which an instrument measures a particular phenomenon.

tutor - A person with particular skills or knowledge who is retained by the College to advise, instruct or evaluate a student or students on a particular occasion or occasions.

validity - A concept generally concerned with the adequacy of an instrument to measure a particular phenomenon.

value-added - A term that designates the amount of positive change occuring between entrance to a program and measurement.

Appendix A

OUTLINE AND COMMENTARY
ADMINISTRATION, CODING AND RECORD KEEPING OF PERC INSTRUMENTS

1. Establishing PERC Basic Information: Administering the SBI

All students who enroll at the College receive an SBI mailed out by the Research Office.

A. Generating SBI Mailing Lists

1. Computer Services provides each month a listing of all newly enrolled students, plus three sets of mailing labels for those students.

2. Lists are checked with previous month's list to guard against duplication of names.

B. Initial SBI Mailing Process

1. The SBI, a postage prepaid return envelope, and a card indicating student interest in SBI research reports, are sent to each newly enrolled student.

2. The date the SBI is mailed is stamped on each SBI.

3. Date of mailing is noted on computer listing opposite the student's name.

C. Handling SBI Returns

1. When SBI is returned, the date of return is stamped on the QRE, and a notation of date received is made on the computer listing opposite the student's name.

2. Total number and percent of QRE's returned for each subfile is recorded chronologically by date of return.

3. Subtotal number and percent of QRE's returned is recorded for the monthly mailings.

4. Social Security Number given by student on QRE is verified by mailing listing Social Security Number.

5. Center or Unit response by student is verified by mailing listing of Center or Unit.

6. Any SBI returned later than three months after date of administration is not usable for research studies and is placed in a dead file. Very few SBI's fall into this category (no more than 20 cases out of 2700 to date).

7. Usable SBI's are filed by date of administration until coded and the coded information is computerized.

8. SBI's are stored in filing cabinets by Social Security Number order for each subfile created. Subfiles are created approximately every 6-8 months and include all the SBI's for that time period.

D. SBI Follow-up Procedures

The initial mailing yields returned questionnaires for about 35% of all those initially sent SBI's.

1. First Follow-up - Follow-up cards are mailed to non-respondents three weeks after the original mailing.

   a. Date of first follow-up is noted on the monthly mailing list of enrolled students.

   b. Follow-up cards produce a return of approximately 15%, yielding a total return of 50% of all SBI's sent.

2. Second Follow-up - Follow-up letters are mailed to all non-respondents three weeks after the first follow-up cards are mailed.

   a. Included in this mailing are a cover letter requesting the student's cooperation, a second copy of the SBI, a second return envelope, plus a second card requesting research reports.

   b. Follow-up letters result in a return of another 15%, yielding a total response rate of 60-65% of all the SBI's sent.

II. Administration of the Longitudinal (MAXI) Study

A. Selecting the Samples: Procedures

1. For each of the subfiles created in the processing of SBI returns (every 6-8 months), a sample of candidates for participation in the longitudinal study is drawn either on the basis of the student typology or a representative group. A computer printout of these samples recording the student's name, address and phone number, social security number, age, sex, college location and enrollment date becomes the basic working record for the MAXI study.

B. Securing Participation of MAXI Sample Candidates

1. Each prospective candidate is sent a special letter inviting him/her to participate in the study. A copy of the SEQ is included with this invitation so that the respondent can indicate his/her cooperation by returning the SEQ in a prepaid envelope. About 60% of the individuals receiving this motivation to participate respond by returning the SEQ.

2. A follow-up letter is mailed to each candidate not agreeing to participate three weeks after the original mailing. Date of follow-up is recorded on the MAXI sample list. This procedure yields about 15% response.

3. A second follow-up letter is mailed to the remaining candidates about two weeks after the first follow-up letter. Included in this mailing are the original letter requesting the student's cooperation, a second copy of the SEQ and a prepaid return envelope. This follow-up procedure yields another 10% response, so that the total response rate of 85% has been achieved for the subfile selected candidates.

4. Remaining Non-Respondents - The 15% prospective candidates who do not respond after the second follow-up are removed from the sample and replaced with similar candidates so that the sampling characteristics remain the same.

C. Administering the SEQ, PCQ, GFQ and AQ

1. The SEQ is enclosed with the letter inviting candidates to participate in the study. The SEQ is mailed out after each student has developed a degree program and portfolio and has been reviewed by the Office of Program Review and Assessment. A research assistant checks the assessment lists for the names of those candidates in the study who have completed the assessment process.

2. The PCQ is sent out to those students who have either graduated or who have entered their final learning contract at the College. The graduation status of the student is determined from the monthly computer list run on the cohort of students in the MAXI study. Each student is likely to have a different length of stay at the College; therefore, monthly tracking of all participants is imperative to determine the appropriate time for sending out PCQ's.

3. The GFQ is sent out to all graduates who have left the College for a minimum of two years. The date of graduation is recorded on the computer list so that the prospective GFQ date can be determined.

4. The AQ phone interview is made for all those students who withdraw from the College for a minimum of eight consecutive months. Again, the monthly computer lists run on all the students in the MAXI cohort are used to determine whether a given student has been withdrawn from the College for eight consecutive months.

5. Follow-Up Procedures - For the SEQ, PCQ, GFQ and AQ, the same follow-up procedures are employed as were outlined under Section B.

D. Record Keeping Arrangements for the MAXI Instruments

A special discussion of the record keeping process for administering the questionnaires is necessary since there are a number of pieces of information to keep track of.

1. Monthly Status Reports - Each month an updated computer list is run which shows the current status of all individuals in the study. A summary report is prepared which shows the number of original students who have withdrawn, been dismissed, graduated or are still enrolled and how far they have progressed in their degree program. The summary report also shows the number of SEQ's and PCQ's sent out and the number returned.

2. In addition to the monthly status report, a card file is kept of all enrolled students in the SBI samples. The card contains the following student information on individual cards: the name of the student's mentor, learning center, social security number, address, enrollment date, degree program area, date of OPRA approval, amount of advanced standing, dates on which questionnaires are sent out and returned, graduation date and degree granted.

III. Coding Procedures for PERC Instruments

A. Preparation of Coding Instruction

Separate coding instructions were developed for each questionnaire by a research assistant. The initial draft of the instructions were reviewed by two professional researchers to insure that the instructions were accurate, complete and to anticipate analysis problems that might arise from the coding process. The coding instructions were revised and pretested on a handful of questionnaires prior to final determination of their form. Coding instructions are available for each instrument.

B. Preparation of Coding Sheets for Key Punching

A coding sheet was specifically designed for each questionnaire wherein the coders entered the appropriate numbers from the coding instructions. The coding sheet facilitated the process of coding, allowed for easy reliability checks and speeded up the key punching process.

C. Selection and Hiring of Coders

Coders were recruited from a pool of applicants for part-time coding work paid at a State rate of $3.18/hour. Coders hired were College educated housewives and students who had flexible schedules that enabled them to work during peak coding periods.

D. Training and Evaluation of Coders

Coders receive a two-day try-out period where a professional briefly introduced the PERC project and explained the importance of coding and a supervisor of coding explained the coding instructions, the code sheets and the overall process. Each coder then started coding SBI's which were reviewed by the coding supervisor for accuracy and discussion of problem areas.

After three months of coding, each coder is reviewed by the Research Staff to insure reliable coding work and to assess whether the coder should continue coding.

E. Coding Procedures for PERC Questionnaires

1. Upon receipt of 50 or more questionnaires of any type, coding begins. All coding activities are reviewed by a supervisor. Any difficult coding problems are referred to a professional researcher directing the project for discussion and decision. Any such coding decisions are recorded and subsequent similar problems are coded in the same manner to insure consistency of coding.

2. Types of Coding Judgments

   a. Standard Checkoff Items - Most items on the questionnaires were straightforward, easily codable questions where the coder translated the respondents checkmark into a number on the code sheet.

   b. Discretionary Judgments - There were several open-ended items and responses in "other" categories that required the coders to decide according to specific rules how the response should be coded. Special logs for recording these responses were designed to provide both a computer code and retain the information as stated by the respondent. See attached log as example.

3. Coding Process

   All coded questionnaires and code sheets (together) are arranged in order of their Social Security Number.

4. All Logs of Other Responses (those responses which do not fit properly into existing code categories) are checked for possible mis-interpretations or ways to recode into the existing basic code framework. A maximum effort is made here to reduce where possible other responses into the basic code frameword for a particular item.

5. Questionnaires and code sheets are now separated. Questionnaires are now filed by Social Security Number and subfile date in the questionnaire files maintained in the Research Office.

6. Code sheets are sent to the computer center for key punching and entry into the computer system. Each student's code sheet is verified by a separate repunching of the IBM cards.

7. Initial Computer Runs - Checks on Coding Errors

When the marginal runs are provided by the computer, each item is checked to detect coding errors and other problems associated with the coding process.

8. Reliability and Validity

Ten percent of all questionnaires coded are recoded by a second coder and indicated on the coding sheets. The percentage agreement on all the variables for each questionnaire for the two coders is computed and aggregated for the 10% coding sample checked for reliability. For example, of 500 SBI's recently coded, 50 of these were recoded by a second coder. On each of the 230 variables on the SBI, the percentage of agreement is 97%. This exceptionally high reliability rate is accounted for by three factors: (1) the coders are well-qualified individuals who are college graduates; (2) they have been extensively trained; (3) they have been employed as coders for some time, thereby gaining experience and understanding of the questionnaires and the coding process. The variables which require straightforward, factual responses present little problem in coding - e.g., the variable describing the size of the respondent's hometown. Most coding disagreements occur when judgmental decision must be made by the coders - e.g., the variable which describes the respondent's degree of involvement in volunteer activities. In this case, the coding is dependent upon the coder's interpretation and ranking of the student's written statement of volunteer offices held.

Validity checks are planned to match various demographic variables and academic information on the SBI with corresponding data in the Student Master File which contains information from official College records.

IV. Record Keeping in Research Office for Case Study Files

MAXI Study Files

For each student who agrees to participate in the longitudinal study, a special research office file is set up. This file includes the following items:

1. All the basic questionnaires (SBI, SEQ, PCQ, GFQ, AQ) are pulled from the separate files set up for coding purposes and placed in an individual file labeled with the student's name and Social Security Number.

2. In the individual student file will be placed copies of all College documents, including degree program statement, portfolio summary, learning contracts and digests and evaluations. These documents form the core for the content analysis strategy used in the case study sample. Scoring rules, definitions of content analysis categories and appropriate forms have been developed to carry out this strategy of analysis.

3. The individual student file also contains student and faculty rating forms for the case study sample as well as the interviews conducted with those same students and faculty. Coding instructions and code sheets have been prepared for the rating forms.

Appendix B
COMPUTER PROCESSING FOR PERC

Even the simplest computations become exceedingly tedious when the number of cases under analysis become fairly large. Therefore, access to a computer is essential to carry through a program such as PERC. The hardward required, however, is minimal if the research department operates under a multi-programming system with remote job entry. In that case, only a key-punch machine, a printer, a card reader, and the system console are required. This minimal setup has proven sufficient for the PERC program at Empire State College.

To process data, users of PERC or similar data-management plans will require computer programs. Programs vary in their costs and capabilities. Computer programs can be prepared by the staff of the local computing center or so-called "canned" programs can be purchased. One such popular program is SPSS (Statistical Package for the Social Sciences). SPSS provides a number of products ranging from simple counts to multi-variate statistics. SPSS is frequently revised and its latest version incorporates a number of useful non-parametric statistics. One especially useful feature of SPSS is its ability to draw random and stratified samples efficiently.

While experience with SPSS at Empire State College leads us to commend its use to others, its shortcomings should also be noted. The package is weak in providing statistical options for researchers wishing to construct new tests or measures. Second, modification of the program to meet special requirements is expensive. Third, the program is a batch-processing system rather than an interactive system. This latter feature makes it impossible for the researcher to sit at a computer console, observe various outcomes, and try out new hypotheses. All these are not major limitations, however, and we recommend the use of canned programs such as SPSS.

It is difficult to report costs for specific computer "runs" because the formulas for the computation for cost vary from place to place. The SUNY computing center in Albany, New York determines ESC's computer costs using a formula that takes into account number of print lines and moments of CPU (central processing unit) time. The CPU time cost is now about $940/hour. This works out to be $15.67 per CPU minute. One of the most complex set of computations performed under the PERC program is factor analysis. This type of analysis is helpful in the perfection of new instruments and in the development of typologies. With approximately 1600 cases, the SPSS factor program required 1.47 CPU minutes to carry the analysis through from initial computation of Pearsonian correlations to the final Varimax rotation. The total cost incurred, therefore, was $23.03 for that run. Experience at ESC shows that the development of a new instrument may require as many as three such runs to "shake down" the original questionnaire items into usable factors. As a rough guide, then, a researcher using SPSS should plan on a minimum of six minutes of CPU time for each new instrument if factor analysis is indicated in the methodology. Simpler computations require less time but to some extent the actual time required depends on the amount of data (e.g., the number of cases) that must be processed. There are so many variables involved in estimating direct computing costs that it is impossible to go beyond what has already been said.

A major indirect cost is preparation of the data for "input" into the computer. There are two aspects to this: coding by the research office, and card-punching by the computing center. The former takes much more time of course and is much more costly. Elaborate rules must be developed for coding questionnaire responses and coders must be trained to code reliably. Experience at ESC shows that about two weeks are required to develop a trouble-free coding manual, and that new coders

require about one month of close supervision before they are able to code reliably. Of course, the number of coders required depends on the complexity of the research instrument, the size of the sample, and the time constraints.

The card punching is done at ESC by a full-time key-punch machine operator. In order to ensure that errors are kept to a minimum it has been our practice to prepare two decks of cards for each set of data and to verify the accuracy of the punching operation by comparing the two decks. This is a good practice and is worth the additional expense. But since the costs of coding-manual preparation, coding, and punching are variable from place to place it is not possible to make good estimates for the costs of these operations as they might apply elsewhere.

A consortium of PERC-users could hold down computer costs by centralizing computer operations at one place. In the past, the research office at ESC has performed computer operations for other institutions cooperating in the PERC program. The major requirement is that the cooperating institution stringently apply coding manuals developed at ESC. They can key-punch the cards themselves or merely send out the completed code sheets. In this respect, our experiences have been good. The computer programs have run without trouble and the involvement of ESC's research office has been minimal. The printout is then shipped back to the cooperating institution.

One of the major problems in applying a data-management plan such as PERC is strain on computing center facilities and staff. If the research office is energetic it is not hard to develop a large data-base in a short time. And if the research office is manned by people who are

very curious about everything, it is not hard to develop a long list of computer runs to be performed. Budgetary factors and a sense of immediate priorities will usually restrain enthusiasm for data-processing but even so it is probable that some friction between the research office and the computing center will be experienced. The friction of course has to do with competing demands made on the computing center. Experience shows that the problem evaporates if the computer center designates one programmer as liaison to the research office, if the research office does not demand quick turnaround times, and if the research office gears its load to the load-cycle of the computing center. Since the central processing unit never stops working, and since SPSS is a batch-processing program, it is possible for the computing center at ESC to load programs just before quitting time on one day and to obtain the output on the morning of the next day. It is highly unlikely that any researcher would require faster turnaround time than that.

Friction between the computing center and a research office can further be reduced by carefully planning the sequence and phasing of the research so that waiting for computer printout will not stall a variety of operations. Since every research program is to some extent unique and takes unpredictable turns or suffers unpredictable set-backs, it is difficult to formulate an exact calendar of operations. Still, even a rough calendar will enable the director of research to give advance warning to the computer center, and if he knew something about the expected waiting time, he could plan to carry out other operations while his materials are being computer-processed. This kind of forward planning, we are frank to say, usually smooths relationships with the director of the computer center.

If computer costs are specified in the budget for PERC, it is encumbent on the director of research to operate within those constraints. Normally, in a university setting, these kinds of constraints are not tight. But if that is not the case, the director of the computer center must set up an account whereby regular reports are sent to the research office indicating CPU time still available under the budget. Knowledge of time-still-available may be essential for the researcher in determining his strategy for analysis. Furthermore, computing center account sheets may be very useful records in explaining the expenditure of funds.

In closing this section on computer processing, it is essential to point out some of the hazards associated with computer-based research. As the research develops, many interesting new questions are raised. There is a very strong temptation to bend the research plan to incorporate the new questions within the plan's original boundaries. Sometimes this bending is legitimate, sometimes it is not. The temptation is strong because of the relatively low cost of computation by modern high-speed machines. This temptation is strengthened by the natural hope of turning up valuable findings serendiptously. In the history of science such findings have occurred but a balance has to be made between prescribed operations and exploratory "just for fun" operations. Our own experience with PERC shows that a set of sound inferences is the minimal requirement for purely exploratory "extracurricular" research. And scratching every research itch sometimes produces correlations that are hard to explain. The classical principle of computer usage still holds: "Garbage in, garbage out."

Appendix C

ALTERNATE REPORT FORMATS: EFFECTIVE COMMUNICATION

THE CHALLENGE

The utility of PERC as a data-management system for educational institutions depends on getting the right kind of data to the right person at the right time. This requirement constitutes the inner core of the problem of format design.

The full complexity of the problem of choosing an appropriate reporting format is revealed if a distinction is drawn between (1) "data" and "information," and if (2) the distribution of reports is cognized in system-analysis terms. Followers of the Shannon-Weaver theory of information treat "information" as any input that helps to resolve a problematical situation. For example, if one has a fair coin and is trying to predict the outcome of the very next toss, data about the history of the coin's behavior has zero informational value. On the other hand, if one has a biased coin, data about the history of the coin's behavior would contain substantial information. Transforming this illustration back into the context of PERC, we may say that the central task that must be accomplished under the heading of "reporting formats" is to ensure that the output provided by PERC will contain information.

The system-analysis aspect of the format problem has to do with cost-time factors associated with getting a report to the proper person. Some data have wide audience appeal and transmission of the analysis is not an urgent matter. But some reports may be critical for organizational policy and may demand prompt attention. In that case, it would pay to

(1) identify the proper target for the report, (2) shape the report in ways that give salience to relevant findings, and (3) accelerate the production and distribution of the report. The solution of these aspects of the format-design and distribution process is confounded by certain practical considerations. Educational organizations are not military organizations: lines of authority and sets of responsibilities may be changing, vague, and poorly understood. It is not always clear who is the proper target for a given research report and this is especially true when a problem falls between two or more offices. Second, shaping a report to give salience to policy-relevant aspects of the findings requires that the report-writers know a great deal about the operations of the policy-maker's office, the commitments of that office, and the preconceptions - if any - of the policy-maker. Lastly, correct handling of the speed of production and delivery aspects of the format problem requires that PERC managers keep abreast of decisions-in-process on the campus. The idea is to get the information to the potential user before a decision passes through a series of irreversable junction-points.

To a very great extent the complexity of the task of designing appropriate reporting formats depends on the organizational structure and the basis of decision-making. In colleges where the research office is on the lowest line of the organizational chart, where the director of research must pass research findings up through a long chain of command, where a low-status director of research must confine his social contacts to status co-equals, the question of appropriate format may be irrelevant. This is doubly true if the college's top leadership is indifferent to empirical research. In this kind of environment PERC can function only in a very limited way and the

whole question of format is irrelevant. Conversely, PERC is most effective in when the director of research has ready access to the highest officials of the college and when the research staff is "plugged into" various institutional bodies: the administrative cabinet, the faculty Senate, planning task forces, faculty committees, and so on. Obviously, such social networks can be used to popularize and reinforce findings emerging out of the PERC program.

But more to the point, network memberships can be expolited by the research staff to learn more about current and developing user needs for information, to anticipate policy issues that will confront various college offices in the future, and to design publication formats that are especially suitable for those offices. In sum, no formal scheme of information production and distribution can be successful unless a certain minimal level of social participation in the college's social structure - formal and informal - is maintained by the PERC staff. Participation is perhaps the key fact in making sure that the right information gets to the right person at the right time and in the right format.

The problem of format, especially as it pertains to level of informational specificity reveals in microcosm many of the problems that inevitably exist in the relationship between technical experts and policy-makers. The policy-maker is frequently required to make decisions about the use of the organization's resources. He does not want to waste these resources: the long-run fate of the institution depends on the accuracy of his judgment. Obviously, in making judgments he wants to run the least risk of making a wrong decision; hence, he relies on a staff of experts. He wants to know the exact conditional probabilities of success associated with various courses

of action. With that level of precision he is in the best (i.e., most rational) position to choose among several courses of action. But that level of precision is difficult to attain in practice in the area of educational research. Available resources may preclude the use of adequate samples, changing conditions may tend to vitiate the utility of data in the possession of the expert, causal connections may be hard to trace out in the absence of opportunities to apply experimental controls, and instrument reliability and validity of measures may be variable across time and population. The dilemma confronting the researcher-expert in deciding the level-of-detail aspect of the format problem pivots on these two horns: (1) a report that suppresses references to fine details may mislead the policy-maker by falsely exaggerating the certainty of the findings; (2) a report that carefully reveals all the details may strain the policy-maker's ability to understand the report and obscure definite findings. Therefore, level of informational specificity is a non-trivial aspect of the format problem.

A related problem that develops as the consequence of the energetic deployment of a data-management plan is that large amounts of data are produced. At the same time, the availability of computers makes it relatively cheap to process these data. These two facts, together with the natural impulse not to "sit on the data," may impel the researcher to produce a batch of reports. It may be hard to see how this sort of situation could have any deleterious consequences; yet, that <u>is</u> possible in the absence of a careful plan that covers report-distribution. A busy policy-maker can be easily overwhelmed

by the countless reports that pass across his desk. Critical reports can be obscured by less important reports and lose the significance that they deserve. The credibility of important reports may be subverted by the superficiality of a few unimportant reports. Indeed, the flood of data may have peculiar impacts on a policy-maker. If he reads and studies closely every report that can be generated, he may become a "data-dependent" personality, the kind of person who must have perfect information in any decision-making situation. This illicitly shifts the obligation to make the right decisions to the researcher. Conversely, if the flood of reports produces a state of fatigue, the policy-maker may become repelled by data management schemes altogether; he becomes "data-resistant." In that case, the policy-maker illicitly robs the researcher of opportunities to "input" into policy matters. All these observations suggest that PERC's effectiveness requires that report-design and distribution be given careful attention.

THE RESPONSE

At Empire State College, data generated by the PERC program is transmitted via five formats: "bullets," occasional papers, research reports, monographs, and handbooks. These formats vary in terms of specialization of subject matter, level of data analysis, function, type of audience, and other variables. Bullets address highly specific questions, are aimed at the faculty and administrative staff, and usually display simple, univariate tables. This form is used for "hot" issues that require a fast response from the research

office. Occasional papers treat a single issue, are longer, and have a wide audience. Research reports are policy-oriented, in-depth analyses of organizational problems; frequently they are produced for a specific college department. Monographs are lengthy documents of a scholarly sort, oriented to broad educational issues and directed to a national, professional audience. Handbooks are detailed methodological treatises that are used for implementing some part of the PERC plan.

Sometimes the determination of which of these formats to use is settled by a conference between the staff of the research office and the person who requires the information. If the requesting agency knows exactly what it wants, and if the information is readily available, the appropriate format could be decided in a moment. Conceivably, a computer printout is all that is required. However, even in user-initiated research, the situation is seldom that simple. Experience at ESC shows that sometimes people cannot formulate questions in a form that is specific enough to direct research activity. Perhaps the required data are not immediately available and the original research question must be modified to fit the data base. Even the level of analysis may have to be re-defined. For example, the requesting agency may ask for a report based on simple, univariate "runs," but if the research staff believes that such computations would be deceptive, the report must be redesigned to incorporate more complex statistical treatments. With these facts in mind, it is easy to see how important close communication is between providers and users of information.

A good example of close communication between the college administration and the PERC program is revealed in a recent series of ESC bullets. The administration was concerned with ESC graduates;

their work experiences, their opportunities for increased work-related benefits (e.g., promotion), and their access to graduate schools. The longitudinal design of PERC enabled the research office to draw a sample of recent graduates and to query them in the areas indicated. The results showed that a substantial proportion of ESC graduates sought new employment opportunities and that the overwhelming majority of graduates were looking for jobs that would allow them to exploit their talents and abilities fully. For example, Bullet GR-14 showed that about 85% of the graduates were able to find satisfactory full-time employment. Bullets GR-9 and GR-10 revealed important facts about rates of application to and rates of actual admission to graduate school. Brief expositions and simple tabulations enabled the reader to see what graduate programs ESC graduates were trying to get into and the differential success rates by program.

An instance where a failure in communication eventuated in the production of a report with limited utility can also be cited. Recently, a panel of ESC mentors was convened to sort out problems associated with evaluating student writing ability. One of the immediate concerns of the panel was degree of consensus in ratings. The practical issue was the feasibility of establishing collegewide standards for evaluating student writing ability. Hence, the concerns of the panel were highly relevant to the mission of the institution.

As a part of the process of self-study, panel members were asked to rate 30-40 student essays. These ratings were statistically

analyzed by a variety of techniques. A fairly lengthy report was prepared and circulated to members of a panel. Later, panel members were asked to evaluate the utility of the report. In general, these ratings indicate that the utility of the report was less than hoped for.

The factors that led to the deployment of a defective format are now clear. First, the inability of the author of the report to discuss the style of the prospective report with panel members and to make a final oral presentation was a fundamental slip-up. Second, and this flows from the first point, the author of the report over-estimated his ability to clarify the statistical procedures used to determine degree of inter-rater consensus. Third, it appears that for some panel members the final conclusions were obscured by mystifying, technical language.

Lastly, an instance can be cited where a complex research report was favorably received by the ultimate user in spite of a lack of communication between the user and the research office. In this case, the user was concerned with degree of uniformity in rating student "portfolios." Under ESC's educational program, students are granted college credit for life experiences if they can document the claim that these experiences eventuate in college-level learnings. Portfolios can be complex and run into hundreds of pages. At each center local assessment committees determine the number of college credits that a portfolio merits and this recommendation is reviewed by the Office of Program Review and Assessment (OPRA) in Saratoga.

The basic data, consisting of credit-month ratings of fifteen student portfolios by three independent panels, were analyzed by

several advanced statistical techniques. The report was relatively brief: it reported the statistical coefficients with a minimum of interpretive prose. Yet, even though the communication-relation between the research office and the user was perfunctory, the report was well received. The explanation for this situation, however, is quite simple: the user was an administrator with a good background in social science research methods.

Obviously, this last case is unusual. It does not weaken the argument that the presence of strong "feedback loops" between information providers and users is essential in the design and use of various reporting formats.

The battery of reporting formats used at Empire State College arose out of an awareness of the problematical aspects of the communication process. But as PERC operates in different institutional settings we do not expect that it is possible to map ESC experiences directly into other places. But whatever the variation from institution to institution, the major dimensions of the format problems should be kept in mind: (1) kind of information, (2) type of target, and (3) timing.

THE IMPACT OF PERC REPORTS

Obviously, in a small college the research office finds out about the usefulness of its reports through informal ways, but informal communications do not always provide the kinds of definite information required to alert a research office to potential format problems. It may sound like a Catch-22 paradox, but PERC recommends research into the utility of research reports because it is the best way to build feedback into the research process and to head off the production of reports that end up gathering dust on someone's bookshelf.

In keeping with this logic, questionnaires were distributed to members of the student writing panel, members of ESC's Research Advisory Council, and to members of the Administrative Cabinet. In the first instance, members of the panel were asked to evaluate the utility and intelligibility of the report prepared for the panel and described above. Research Advisory Council members were asked to evaluate specific bullets and reports under several different headings of utility. Lastly, members of the Administrative Cabinet of the College were asked to make an overall evaluation of reports that they receive under the PERC program.

At this moment the number of questionnaires returned to the research office is quite small so that it is hard to speak authoritatively about the relative worth of specific PERC reports. The preliminary data suggest that the utility of a given report depends greatly upon the job-role of the recipient and upon his academic background and training.

A plan to survey the impact of PERC reports on the faculty is "in the works" but has not been implemented yet.

Appendix D

SAMPLE PERC INSTRUMENTS

1. Student Biographical Inventory (SBI)
2. Student Experience Questionnaire (SEQ)
3. Program Completion Questionnaire (PCQ)
4. Graduate Followup Questionnaire (GFQ)

The Student Experience Questionnaire,
the Program Completion Questionnaire,
and the Graduate Followup Questionnaire
have been deleted due to irreproducibility

Dear Empire State College Student:

Empire State is a nontraditional College founded in 1971 with four mandates: to serve a different student clientele from the existing institutions of New York, to provide alternative forms of instruction, to provide quality education, and to do all this for less cost. ESC's responses to these mandates include a statewide "campus," use of individualized learning contracts rather than classes, and procedures for granting credit on the basis of prior school and non-school learning. There is widespread interest in these efforts throughout New York State and the nation. This questionnaire, the Student Biographical Inventory (S. B. I.), is an important part of the College's reply to this interest.

The S. B. I. is designed to provide a picture of the students attending ESC, their reasons for coming here, and their goals. It is the first link in a long-term effectiveness study conducted by the College Office of Research and Evaluation and supported by a grant from the United States Department of Health, Education, and Welfare. Our design calls for follow-up questionnaires and interviews with some of you at three other points: sometime during your studies, at graduation, and a year or two later. The aim of this research is to uncover what kinds of students change in what kinds of ways following what kinds of experiences and at what costs. S. B. I. results will help ESC improve current programs and make better-informed planning decisions as well as help other states determine whether they should undertake development of similar institutions.

We encourage and solicit your assistance on this research instrument. Note that this S.B.I. is NOT a test. The only "right" answers are those which reflect your own perceptions, judgments, and opinions. If for some reason, you do not wish to answer a particular question, it is your option. This is a VOLUNTARY QUESTIONNAIRE. However, be assured that YOUR RESPONSES WILL BE HELD IN THE STRICTEST PROFESSIONAL CONFIDENCE. That is, an individual's response will be available to the Research staff only and under NO circumstances will individual responses be reported to anyone. We ask for identifying information to allow the Office of Research and Evaluation to conduct the various follow-ups mentioned above.

The S.B.I. includes questions seen as sensitive by some people. For example, we ask about such things as your race, ethnic orientation, financing, and parents' occupations. These questions were chosen because they are areas in which ESC students may be similar to or different from students at traditional institutions. Since Empire is mandated by the State of New York to serve students not generally served by traditional modes of higher education, this is vital information for a study of institutional effectiveness.

The Office of Research and Evaluation will prepare various reports using aggregate information obtained from the S. B. I. If you would like copies, please send the enclosed postcard. Also, if you want an explanation of the rationale behind any item on the S. B. I., please contact the Office of Research and Evaluation.

We think that the S. B. I. will help focus your thinking about educational goals and about Empire. It should take no longer than 15-30 minutes. When you have completed it, please mail the questionnaire to the Office of Research and Evaluation in the enclosed envelope.

Thank you for your help.

I. GENERAL INFORMATION
The following questions ask for background information about where you have lived, your occupational interests and the community where you grew up. Mark the appropriate answer an indicated in the question.

1. Name

2. Social Security Number

3. Your Empire State College Center or Unit?

4. Your Sex: Male Female

5. Year of Birth

6a. Marital Status Married Not married

b. How many children do you have?

c. How many dependents live with you (include spouse)

7. Have you ever served on active duty in the United States Armed Forces?

Yes, am serving now No

Yes, but not serving now

8. How many years in total have you resided in New York State?

Never 6 - 10 years

Less than 1 year 11 or more years

1 - 5 years

9. How many years have you resided at your present address?

Less than 1 year 6 - 10 years

1 - 5 years 11 or more years

10. How many states have you resided in (include N. Y.)?

11. How many countries have your resided in (include U.S.)?

IF YOU DID NOT LIVE WITH YOUR NATURAL PARENTS, ANSWER THE NEXT TWO QUESTIONS ABOUT THE PARENTS OR GUARDIANS WHO MOST INFLUENCED YOUR LIFE.

12a. What is the highest level of formal education obtained by your parents and spouse? (Mark appropriate level for each parent and spouse)

	Father	Mother	Spouse
Grammar school or less			
Some high school			
Finished high school			
Some college (less than AA or equivalent)			
Associate degree (AA or equivalent)			
College degree (BA, BS, etc.)			

Father Mother Spouse

Some graduate of professional training
Graduate or professional degree
Does not apply

b. In addition, did they

Attend Trade School
Graduate from Trade School

13. On the lines below, please indicate YOUR primary occupation, your SPOUSE'S, your FATHER'S, and that of your MOTHER. Please be as specific as possible. (e.g., Shop Foreman, Ford Plant; Housewife; Jr. High School Teacher; Retail Salesperson, "Sears" and other stores; President of Local Union, I.U.E.)

a. YOUR primary occupation

b. Your SPOUSE'S primary occupation

c. Your FATHER'S primary lifetime occupation

d. Your MOTHER'S primary lifetime occupation

14. Please indicate on the line below if you have held a second job in the past year and what it was. ( ) (Check here if not applicable)

---

15. If employed, how many hours per week do you work? (mark one)

Does not apply (e.g., housewife, unemployed) ( )
10 hours or less ( )
Between 11 and 20 hours ( )
21 to 30 hours ( )
31 to 40 hours ( )
Over 40 hours ( )

IN ORDER FOR ESC TO COMPLY WITH US OFFICE OF EDUCATION DATA REQUIREMENTS ON RACE, COLOR, AND NATIONAL ORIGIN OF ITS STUDENTS, WE REQUEST THAT YOU RESPOND TO THE FOLLOWING QUESTION.

16. Are you (please mark the one that best applies):

White/Caucasian-American
Black/Negro/Afro-American
American Indian
Oriental-American
Mexican-American/Chicano
Puerto Rican-American

other (e.g., foreign student)

17a. Do you feel a strong identification with any ethnic group (e.g., Italian)?

Yes No

b. If yes, please specify _____

18. Which best describes the community that you thought of as your hometown when you were in secondary school? (Mark one)

18 cont.

Farm or open country

Town (under 10,000)

Small city (10,000-100,000)

Medium-sized city (100,000-500,000)

Large city (500,000 or more)

19. Please list all voluntary programs or civic organizations in which you have participated in the past fieve years (e.g., Fire Dept., Church activity or Auxillary groups, School Board, Little League)

Program or Organization	If you held an office, please name it below:

II. PREVIOUS EDUCATION

The following questions deal with previous accomplishments that apply to your high school and college experiences.

20. From what kind of secondary school did you graduate?

Public high school
Private (nonreligious, nonmilitary)
Church-related
Other (please specify) _____
Private military academy
Did not graduate

21. Where did you rank academically in your high school graduation class?

Top 10 percent
Top quarter
Top half
Bottom half
Don't remember

22. How hard did you study in high school?

I studied very little, less than average
I studied about the same as most students
I studied hard, more than average
I studied very hard, much more than average

23a. Is this the first time that you have enrolled in any educational institution beyond high school?

Yes
No

23b. If no, please list previous institution(s) and reasons for leaving.

Institutions and Cities	Reasons for Leaving

24a. Have you ever attended a proprietary institution (e.g., barber school, business school, secretarial school, mortician school, etc)?

Yes No

b. If yes, please list institutions, cities, type of school, and whether you finished.

Institutions and Cities	Type of School	If you finished, please check.

25. Have you ever taken in-service training courses in connection with your job (e.g., at General Electric, Civil Service course, etc.)?

No

Yes If yes, please describe briefly.

26. When did you last study for credt at a high school, college, or other recognized institution (e.g., trade school, correspondence school)?

Does not apply
Within past year
Between 1-5 years
Between 6-10 years
Between 11-20 years
20 years or more

27. Are there any other learning experiences that you consider to be highly significant (e.g., Peace Corps, extraordinary travel, etc.)

The following questions concern your ability to finance a college education, and people supports.

28. Do you have any concern about your ability to finance your college education?

I am confident that I will have sufficient funds without any financial aid.

I will probably have enough funds without any financial aid.

I will probably have enough funds but may need some financial aid.

I will be able to complete college only with financial aid.

I am not sure I will be able to finish college even with much financial aid.

29. Sources of financing:

	Major	Minor	Not a Source
a. Full and/or Part-time work			
b. Savings			
c. Parental aid			
d. Employer support			
e. Aid from spouse			
f. Grants			
g. Loans			
h. Other (please specify)			

30. What was your total income last year independent of your parents. Consider annual income from all sources before taxes. (If married, include spouse's income)

None
Less than $1,000
$1,001 - $4,000
$4,001 - $7,000
$7,001 - $10,000
$10,001 - $15,000
$15,001 - $20,000
$20,001 - $30,000
$30,001 +

31. Given your other responsibilities (job, marriage, family, etc.), how difficult do you think it will be for you to "keep up" at Empire?

I can do what I have to do rather EASILY.

Going to ESC, under current circumstances, will require SOME effort.

Going to school, under current circumstances, will require a VERY SUBSTANTIAL effort.

I am concerned that I MAY NOT be able to do all the things planned.

32. How do your family, friends, and employer feel about your enrolling at ESC?

	Family	Friends	Employer
Strongly encouraging			
Somewhat encouraging			
Neutral			
Somewhat discouraging			
Strongly discouraging			
Not applicable or I can't say			

IV. YOUR SELECTION OF ESC
The following questions concern your decision to enroll at ESC.

33. To how many colleges other than Empire State College did you apply this year at at how many were you accepted?

Applied _____ Accepted _____

34a. What is the single most important reason that you have never before obtained the degree you now seek?

_____

b. Were there any other important reasons?

35. How many miles from your residence is the ESC unit with which you will affiliate?

2 or less	11 - 25	51 - 100	more than 200
3 - 10	26 - 50	101 - 200	

36. How did you find out about Empire State College? (Check as many as are applicable)

a. From an Empire State College student
b. From an Empire State College staff member
c. From advertisements or an article in the media (newspaper, TV, radio)
d. From a staff member of another institution
e. From reading and ESC bulletin
f. From a high school or college counselor
g. From my employer
h. From a friend or family member
i. Other (please specify)

37. What will be your primary area of study at Empire State?

38. In terms of your personal life (e.g., leisure time with family and friends) how much do you think you will have to give up in order to find time for ESC studies?

A great deal Some Very little

39. In deciding to enroll at Empire State College, how important to you was each of the following reasons? (Mark one answer for each reason) Also, circle the letter of the item that is MOST important to you.

	Not Important	Somewhat Important	Very Important
a. The possibility of receiving credit for prior informal learning experiences.			
b. The good reputation of ESC.			

	Not Important	Somewhat Important	Very Important
39c. I have friends at ESC			
d. The low tuition of ESC			
e. A previous ESC student recommended the college			
f. The special programs offered by ESC			
g. The independence allowed by ESC			
h. My boss suggested that I go to ESC			
i. I can work as well as study at ESC			
j. A counselor recommended ESC			
k. My parents wanted me to go			
l. My spouse wanted me to go			
m. I wanted to live at home while attending college.			
n. The chance to obtain a degree quickly			
o. Other (please specify)			

Figure 6

Question #40, Student Biographical Inventory.

40. Below is a general list of things that people sometimes do. In past year, how many times have you in your leisure:

	Never 0	Rarely 1 - 3	Sometimes 4 - 9	Often +10
a. read some poetry				
b. read a practical book or journal (e.g., Ladies Home Journal, Popular Mechanics)				
c. read articles in intellectually-oriented magazines or professional journals (e.g., The Atlantic Monthly, Commonweal, Science, Harpers)				
d. read the editorial column of a newspaper				
e. read a mystery, spy novel, or similar kind of "escape" book				
f. read accounts of contemporary events in a magazine (e.g., Newsweek, Time, U.S. News & World Report)				
g. read a book on social science (e.g., history, psychology, sociology, geography, economics, political science, education)				
h. read a books in arts and humanities (e.g., music, art, dance, literature, philosophy, religion, a foreign language)				
i. discussed the merits of political/economic system (e.g., communism, socialism, capitalism, etc.)				
j. discussed world or national problems				
k. discussed social issues with friends (e.g., civil rights)				
l. discussed a scientific theory or event (e.g., open heart surgery)				
m. discussed art or music				
n. discussed philosophy or religion				
o. discussed plays, novels or poetry				
p. discussed a movie				
q. discussed a sports event				
r. discussed recipes, home decorating, etc.				

	Never 0	Rarely 1 - 3	Sometimes 4 - 9	Often +10
s. attended a scientic lecture				
t. visited a scientific exhibit				
u. took tours of factories, businesses, etc.				
v. observed governmental agencies (e.g., FBI, US Mint)				
w. attended a stage play				
x. attended a movie				
y. attended a lecture on a current social, economic or political problem				
z. attended a music recital or concert				
aa. attended a sports event				
bb. visited an art exhibit				
cc. visited a library				
dd. tried some sketching, drawing, painting, sculpture, etc.				
ee. watched TV news specials (e.g., Watergate) or documentaries (e.g., Inside the Bamboo Curtain: Red China Today)				
ff. explained or illustrated a scientific principle to someone				
gg. watched a sports even on TV				
hh. attempted to invent something or to solve a mathematical puzzle				
ii. attempted to fix a complicated piece of machinery (e.g, auto, sewing machine, TV)				

41. Rate yourself on each of the following traits when compared with the average person of your own age. We are interested in estimates of how you see yourself.

Trait	Lowest 10%	Below Average	Average	Above Average	Highest 10%
a. Ability to handle stress					
b. Academic ability					
c. Athletic ability					
d. Artistic ability					
e. Cheerfulness					
f. Drive to achieve					
g. Idealism					
h. Impulsiveness					
i. Independence					
j. Leadership ability					
k. Mathematical ability					
l. Mechanical ability					
m. Optimism					
n. Originality					
o. Personal Organization					
p. Persistence					
q. Popularity					
r. Public speaking ability					
s. Reading ability					
t. Resourcefulness					
u. Self-confidence (intellectual)					
v. Self-confidence (social)					
w. Sensitivity to criticism					
x. Stubbornness					
y. Tolerance					
z. Writing ability					

42. At Empire State College how important is it that you achieve the following general objectives? (Mark one answer for each reason) Also circle the letter of the item that is MOST important to you.

	Not Important	Somewhat Important	Very Important
a. To increase my appreciation of art, music, literature, and other cultural expressions			
b. To discover my vocational interests			
c. To attain specific skills that will be useful on a job			
d. To develop a new career			
e. To meet the academic requirements necessary to enter a profession or graduate school			
f. To become involved in social and political concerns			
g. To increase my awareness of different philosophies, cultures and ways of life			
h. To improve my chances of making more money			
i. A degree is required for my present or future job			
j. To learn how to participate effectively as a citizen in my community			
k. To develop an understanding and an appreciation of science and technology			
l. To improve my self image			
m. Simply, to learn			
n. To improve my professional status			
o. To increase my desire and ability to undertake self-directed learning			
p. Other (please specify)			

43. What is the highest academic degree that you intend to obtain

None

Associate degree (AA or equivalent)

Bachelor's degree (BA, BS, etc.)

Master's degree (MA, MS, etc.)

Doctor of Philosophy or Education (Ph.D. or Ed. D)

Medical degree (MD, DDS, etc.)

Law Degree (LL.B., J.D.)

Bachelor or Doctor of Divinity (BD or DD)

Other (please specify)

44. Listed below are areas of intellectual competence of particular concern to some students. Indicate where you think you are now in relation to other people your age. For more complete descriptions of these areas, see the section on College Objectives in your Empire State Catalogue. We realize that this is a difficult item, but please give it your best shot.

AREAS OF INTELLECTUAL COMPETENCE	WHERE YOU ARE NOW IN RELATION TO OTHERS YOUR AGE Lowest 10%//Below Aver.//Aver.//Above Aver//Top 10%
a. COMMUNICATION SKILLS: (to write and speak clearly, correctly and effectively)	
b. KNOWLEDGE (of information, theories, generalization, methods of inquiry, and criteria for judgments)	
c. COMPREHENSION of knowledge (thus allowing personal interpretations)	
d. Ability to ANALYZE (to break down an experience into basic elements)	
e. Abilty to EVALUATE (to make qualitative and quantitative judgments about the value of information, materials and methods)	
f. Ability to SYNTHESIZE (to arrange and combine elements so that new patterns appear)	
g. Ability to APPLY (to use theory in practical activities)	

45. Listed below are areas of personal development of particular concern to some students. Please rate where you think you are now in relation to other people your age. For more complete descriptions of these areas, see the section on College Objectives in your Empire State Catalogue. We realize that this is a difficult item, but please try to respond.

AREAS OF PERSONAL DEVELOPMENT	WHERE YOU ARE IN RELATION TO OTHERS YOUR AGE				
	Lowest 10%	Below Aver.	Aver.	Above Aver.	Highest 10%
a. INTERPERSONAL COMPETENCE, the ability to interpret the intentions and attitudes of others and to improvise appropriate responses.					
b. AWARENESS, openness to new ideas and experiences, sensitivity to social conditions and cultures.					
c. CLARIFYING PURPOSES, concerns vocational interests, non-vocational interests, and general life-style considerations.					
d. SELF-RELIANCE, the capacity to act independently					
e. SELF-UNDERSTANDING, the process of self-examination and discovery of personal motives, strengths, and weaknesses.					
f. UNDERSTANDING OF OTHERS, the capacity to move beyond relationships of simple understanding to those where there are sympathetic responses to diverse kinds of persons and their conditions.					
g. SELF-CONSISTENCY, the clarification of attitudes and values so that words and actions are in harmony.					

46. We would appreciate any comments you might have about problems you encountered with this inventory.

Bibliography

Astin, A. Measuring the Outcomes of Higher Education. In H. Bowen (ed.), Evaluating Institutions for Accountability. San Francisco: Jossey-Bass, 1974, pp. 23-47.

Blackburn, R.T., and M.J. Clark. An Assessment of Faculty Performance: Some Correlates Between Administrator, Colleague, Student and Self-Ratings. Sociology of Education, 1975, 48 (Spring), 242-256.

Bloom, B., and others. Taxonomy of Educational Objectives: Cognitive and Affective Domains. New York: McKay, 1956, 1964.

Bowen, H.R. (Ed.) Evaluating Institutions for Accountability. San Francisco: Jossey-Bass, 1974.

Campbell, D., and D. Fiske. Convergent and Discriminant Validation by the Multitrait-Multimethod Matrix. Psychological Bulletin, March, 1959, 81-105.

Chickering, A. Education and Identity, Jossey-Bass Inc., Publishers, San Francisco, 1969.

Cox, R.C. and C.E. Wildemann. Taxonomy of Educational Objectives: Cognitive Domain - An Annotated Bibliography. University of Pittsburgh: March, 1970.

Debus, R. Detailed Analysis of Empire State College Effectiveness Program and Relationship to NCHEMS Program. Saratoga Springs, New York: Office of Research and Evaluation, 1974.

Dubin, R. and T. Taveggia. The Teaching-Learning Paradox. Eugene, Oregon: Center for the Advanced Study of Educational Administration, 1968.

Empire State College, Educational Program. Saratoga Springs, New York: Office of the President, 1974.

Feldman, D. and T. Newcomb. The Impact of College on Students. San Francisco: Jossey-Bass, 1969.

Lawrence, B. et.al. (eds.) Outputs of Higher Education: Their Identification, Measurement and Evaluation. Boulder, Colorado: Western Interstate Commission for Higher Education, 1970.

Lenning, O. Attempts to "Structure" Educational Outcomes and Outcome-Related Concepts: A Compilation and Review of the Literature. Staff Paper, Boulder Colorado: National Center for Higher Education Management Systems at WICHE, 1975.

Lenning, O. The "Benefits Crisis" in Higher Education. Washington: American Association for Higher Education, 1974.

The Mini Cost/Effectiveness Study (MCES), A Pilot Effort to Implement a Program Effectiveness and Related Costs (PERC) Model, A Summary Report: Empire State College, Saratoga Springs, N. Y., Office of Research and Evaluation, January, 1976.

Meeth, L.R. Quality Education for Less Money. San Francisco: Jossey-Bass, 1974.

Micek, S. and R. Wallhaus. An Introduction to the Identification and Uses of Higher Education Outcomes Information. Boulder, Colorado: Western Interstate Commission on Higher Education, 1973.

Newcomb, T. et.al. Persistence and Change: Bennington College and its Students After Twenty-five Years. New York: Wiley, 1967.

Newcomb, T. Personality and Social Change. New York: Dryden, 1943.

Nie, N., D. Bent, and C.H. Hall. Statistical Package for the Social Sciences. New York: McGraw-Hill, 1970.

Palola, E., T. Lehmann, A.P. Bradley, Jr., and R. Debus. PERC Handbook. Saratoga Springs, N.Y.: Office of Research and Evaluation, Empire State College, June 1976.

Palola, E. and A.P. Bradley, Jr. [illegible]en Out of Thirty: Studies of the First Graduates of Empire State [illegible]liege. Saratoga Springs, New York: Office of Research & Evalu[illegible]ion, 1973.

Perry, W.G. Forms of Intellectual and Ethical Development in the College Years: A Scheme. New York: Holt, Rinehart, & Winston, 1968.

Sagen, H.B. Student, Faculty and Department Chairmen Ratings of Instructors: Who Agrees with Whom? Research in Higher Education, 1974, 2, 265-272.

Tatsuoka, M.M. Multivariate Analysis: Techniques for Educational and Psychological Research. New York: Wiley, 1971.

Weathersby, G.B. and F.E. Balderston. PPBS in Higher Education Planning and Management. Berkeley: Ford Foundation Program for Research in University Administration, Report P-31, 1972.

Wilson, R.C., J.G. Gaff, and others. College Professors and Their Impact on Students. New York: Wiley, 1975.

Wilson, R. and J. Gaff. Views of Teaching and Educational Change: Faculty and Students. Berkeley: Center for Research and Development, Vol. I and II, 1970.

UNIVERSITY OF CALIF.
LOS ANGELES
OCT 1 1979
CLEARINGHOUSE FOR
JUNIOR COLLEGES